Entered as second-class matter, April 14, 1899, at the Post Office at New York, New York, under the Act of March 3, 1879 (Sec. 415, P.L. & R.).

The MODEL ENGINEER & PRACTICAL ELECTRICIAN

4d

A Journal of Small Power Engineering

Founded 1898

13-16 Fisher St London W.C.1

Vol. 74. No. 1817. THURSDAY, MARCH 5, 1936. Post Free 5d.

The MODEL ENGINEER
Edited by
PERCIVAL MARSHALL C.I.Mech.E

Business Dept.: ALFRED DAWSON
Tech. Research and Workshop Dept.: ALFRED W. MARSHALL, M.I.Mech.E. A.M.I.E.E.

Editorial and Publishing Offices: 13-16 FISHER STREET, W.C.1

Single copies, 4d., post free 5d.
Annual Subscription. 21s. 8d., post free.

VOL. 74. No. 1817. MARCH 5, 1936. PUBLISHED EVERY THURSDAY 4d.

SMOKE RINGS

A Revival at Stoke-on-Trent.

AS the result of the very successful model engineering exhibition recently held at Stoke-on-Trent, it has been decided to revive the model engineering society which existed some 15 years ago. A preliminary meeting has already been held, and Captain T. Lockett has been apointed chairman, and Mr. E. R. Fairweather, hon. secretary. All branches of model engineering are to be catered for, and a strong committee has been formed to look after the interests of the various sections. In an excellent letter to the local Press Captain Lockett wrote:—"Model engineering, in whatever branch one might be interested, is an entrancing hobby. Pleasure untold is the reward of patient labour—delight from the knowledge that something, however small, has been attempted and something done. There are scores of expert model makers in North Staffordshire who know these joys and would willingly pass them on to others whose progress, pleasurable though it may be, would be augmented by getting together and interchanging ideas and notions of common interest." This strikes the right note, and the spirit of this letter promises well for the future of the new Society.

* * *

Spare-time Problems

IF you are a diligent reader of your daily newspaper, you probably saw the interesting little question which was propounded by a speaker in the course of a recent discussion in the House of Commons. For the entertainment of those who missed this little problem, I will repeat it:—"A man went into a bootshop and purchased a pair of boots for 16s., tendering a £1 note in payment. The bootmaker having no change in the till went into the butcher's next door and obtained the necessary change for the note. The customer departed with the boots and 4s. in change. Shortly afterwards the butcher discovered that the £1 note was a forgery, and demanded and obtained the return of his money from the bootmaker. How much did the bootmaker lose by this transaction?" That is a little exercise in mental arithmetic which should not be very difficult of solution, though I believe a great variety of answers have been given. Here, however, is a problem of a different character for which I am indebted to "The Engineering Gazette," the brightly written house organ issued by Messrs. Marryat and Place, Ltd., the lift specialists. This is the form in which it appeared:—"A friend sends us the following problem which we are only too happy to pass on to our readers with a request for an answer as soon as possible. We believe our own arithmetic is equal to the job, but, unfortunately, the ink supply ran out about half-way through our first attempt. All you have to do is to take a piece of tissue paper 1/1,000th of an inch thick and fold it fifty times and measure the thickness of the resultant wad of folded paper; or, if you haven't a suitable piece of paper hand, work the sum out in your head. Our friend did this in eighteen minutes." This seems simple enough, but it reminds me of the old story of the reward offered by an Eastern potentate, to the inventor of the game of chess. The monarch was so delighted with the game that he asked the inventor to name his own reward. The inventor asked for a grain of wheat for the first of the 64 squares on the chess board, two grains for the second square, four grains for the third square, eight for the fourth and so on, doubling the quantity for each square up to the sixty-fourth. The monarch ridiculed the idea of

apparently so modest a reward for such a splendid invention, and urged the inventor to accept a large money payment instead. The inventor persisted in his own idea of a suitable reward and the monarch ordered it to be paid. You may like to work out the end of your story for yourself, and discover the ingenuity of the inventor and the embarrassment of the monarch. These little problems may not be new to many of you, but I hope they will come fresh to others, and may cause a little pleasant arm-chair cogitation, or perhaps some entertaining discussion in the dinner-hour at the works. It does us good sometimes to exercise our minds in a new direction, even if it is not strictly engineering.

* * *

Power Boating at Hastings.

FOLLOWING my recent club notice of the Model Yacht Club at Hastings, I have heard from one of the members of the power boat section that they already have two flash steam boats, one petrol boat, and two prototype steamers, included in the club membership, and other local enthusiasts will be cordially welcomed. Running takes place on Saturday afternoons at 2.30 on the boating lake in Alexandra Park. Mr. T. Bridgeland, of 31, St. George's Road, West Hill, Hastings, will be pleased to answer any enquiries. He tells me that he has just purchased his 1,000th copy of the "M.E."

* * *

A Happy Return to the Fold.

ONE of my old readers in Holland sends me the following happy note: "It must have been some particularly gloomy day (or was it my liver?) when at the end of 1934 I stopped my "M.E." subscription, which had been running, 'through many changing scenes of life,' since January 1st, 1908. To cut matters short, here I am again. I am not only renewing my 'M.E.' subscription, but by way of penance am taking in addition 'Ships and Ship Models.' Let me say, that I am now signing on 'for the duration'!" I think many other "M.E." readers would also like "Ships and Ship Models." It has made friends all over the world. Why not put it on your list?

* * *

To Greenford Readers.

A KEEN beginner residing at Greenford is inspired by my recent "Smoke Ring" on helping the younger generation, to enquire if any reader in his neighbourhood would very kindly allow him the occasional use of his workshop. Any offer of assistance will be duly forwarded.

To Leeds Readers.

THERE seems to be a desire to form a model engineering society in Leeds. The position at the moment is that the Leeds and District Model Railway Club, while specialising in model railway interests, are prepared to enlarge the scope of their Society to include other branches of model engineering, but they are not willing to form a definite model engineering section. This apparently does not quite meet the views of those who are keenly interested in model engineering work, and I am asked to invite Leeds model engineers to get together with a view of considering whether they should accept the invitation of the model railway club, or alternately form a separate society. Those interested should communicate with Mr. John N. Dryland, Winton Lodge, Adel Lane, Leeds, 6.

* * *

Power Boat Progress at Bristol.

A NOTE from Mr. W. T. Medway, the hon. secretary of the Bristol Model Power Boat Club, tells me that they hope to have ten boats running this summer, including a Class C flash steam boat, two 15 c.c. four-stroke engined boats, and three boats with 30 c.c. two-stroke engines. The club intends to compete at the International Regatta this year, and also at Swindon and Farnborough. Mr. Medway says "the Club is headed by a man whose name is outstanding in the model power boat world—Mr. Noble—without whom there would be no Bristol Club." Intending members should communicate with Mr. Medway, at 12, Elgin Park, Redland, Bristol, 6.

* * *

A Model Gift to Portsmouth.

I HEAR from Mr. J. S. Mendez that he has presented his championship model siege gun to the Portsmouth City Council. It can now be seen at the Portsmouth Museum and Art Gallery, at Cumberland House, close to the South Parade Pier, which is open daily from 10 o'clock to 6 o'clock.

* * *

To Derby Readers.

WHY not a model engineering society for Derby and district? This is the question asked by Mr. A. G. Sale, who would like me to "set the ball rolling" with a "Smoke Ring." With its important railway and other engineering interest Derby should assuredly have a live society. Mr. Sale's address is 31, Thornhill Road, Littleover. Get together, Derby!

Percival Marshall

PETROL ENGINE TOPICS

Mystery Troubles.

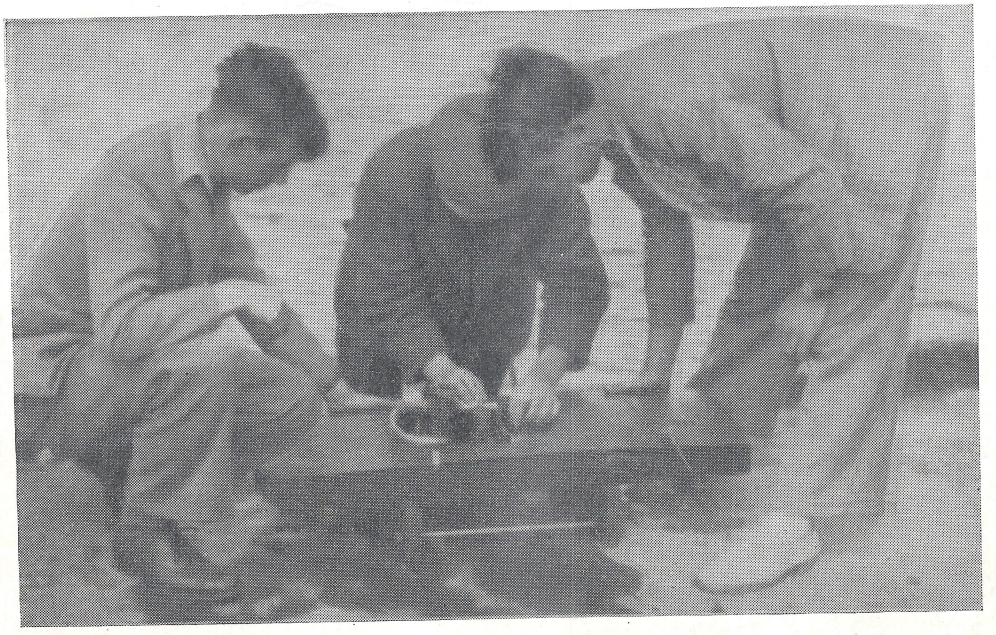
By EDGAR T. WESTBURY.

A WELL known reviewer said recently, apropos the popularity of fiction literature in which a gradually intensified atmosphere of mystery is all cleared up in the last chapter, that "every one loves a mystery—so long as it is not his own." In my experience with I.C. engines of all types, however, I find that the mysteries connected with them, in the form of unaccountable stoppages, failures to start or keep running, or other little outbursts of temperament, constitute a source of intense irritation to some people, while to others—including myself — they account for much of the fascination and pleasure derived from dabbling with them.

Why buy puzzles—

One knows that all these puzzles have a solution, and besides forming a harmless and by no means unexciting form of sport, the linking up of cause and effect is a very sound form of education.

So many subtle laws of physics play their part in the functions of I.C. engines, that even after long association with them, one can marvel that they ever run at all! But, large or small, they all have their queer little ways, and whether one has dealings with them in ships, aeroplanes, cars, motor bikes, stationary work or models, one is sure to encounter the case of the engine that is "absolutely perfect—but won't run!" sooner or later. In such cases, I have come to



—when model petrol engines provide equally good mental exercise?

the conclusion that the smaller the engine, the greater the obscurity of the cause, and the intensity of the effect. Nobody need be ashamed to confess that they have been completely "whacked" by these occurrences; I have, more times than I can remember. And the annoying part about it, in many cases, is when a helpful but blissfully ignorant friend drops in and says, "Hello—won't she go, old man? Here, let *me* have a try!" and straightaway the hateful little beast of an engine responds to his touch and springs joyfully into life!

A Reminiscence.

As my pen has apparently strayed into a channel which is not very highly technical, perhaps readers will bear with me if I digress still further and treat the subject in a reminiscent vein. Some of the experiences I have had—and no doubt many readers could add to them by thousands—appear quite humorous in retrospect, though I assure you that they were not considered in this light at the time. It is not exactly a joke to dismantle the magneto of a farm tractor by the light of a hurricane lamp at 4 a.m. in the middle of a ploughed field, with a steady November drizzle doing its best to damp enthusiasm, or to be struggling manfully to coax to life a paraffin engine in an open motor launch rolling gunwales under in the sort of gale one encounters in the Firth of Forth, with the coxswain yelling (between adjectives) "Get that motor 'eaving before we pile up on Hawes' Pier!"

Some years ago, when motor cars were sufficiently rare that the fellow who could tell the difference between a sparking plug and a differential had some kind of standing among the "lads of the village," I had a job at a fairly large motor repair shop in an agricultural district. One day I was sent out in response to an urgent S.O.S. from a farmer who was completely stranded with a car of a "well known make" (no names—no pack drill!) in a hay field at a neighbouring farm. I hurried out with an emergency tool kit, and was greeted by a farm hand at the gate, who remarked, "Be you come to see to the motor? I doubt you'll do any good with 'un—us have all been havin' a go at 'un all mornin'!" That was cheering news, to say the least.

When I reached the car, the distressed owner came up and, declining to shake hands on account of a very complete set of blisters (on both of them) acquired in the course of a few hours' cranking up, explained "I've located the trouble at last—the ignition is as dead as a door nail. No sign of a spark at all." Knowing just a few things about the fearful and wonderful ignition system fitted to the make of car in question, I was not at all surprised—but I was a second later, when I saw that he had been testing the ignition with the four plugs taken out, and dangling by their leads over the radiator tie rod, quite innocent of any "earth" connection!

The trouble was actually traced to the carburettor, and its cause was typically "local," being a hayseed which had somehow got under the jet, and normally allowed a flow of fuel when the carburettor was "tickled", but formed a most effective ball valve under the suction exerted by the engine.

Beware of Side-tracks.

I could fill a volume with incidents of somewhat similar nature, including one about the air mechanic who carefully primed the oiling system of a recently overhauled "R.A.F. 80" engine from a can which, as he believed, contained Vacuum B.B., but in reality contained *shellac varnish*! The above experience, however, serves as an excellent illustration of how false clues can lead one astray in diagnosing trouble, and one must be constantly on guard against "red herrings." It is most important to get right down to true causes, and while that is not as simple as it sounds, the analytical faculty can be acquired by patience and perseverance. To those who are totally uninitiated, aid is offered by several excellent text books which give a definitely tabulated chart of specific troubles and their remedies. Although it is a rather unfortunate phenomenon that the particular trouble you are investigating is never in the book, this sort of classification is really useful to the inexperienced, as it links up symptoms and causes, systematically, and is an aid to clear thinking in these problems.

A Reader's Experience.

The Editor recently handed me a letter from a Derby reader in which an account was given of troubles experienced with a 1 h.p. horizontal stationary four-stroke engine. The occurrence was by no means an uncommon one, and personally, I do not think it would have given much trouble to a really experienced man, but many readers may encounter something of a similar nature, and may be saved a great deal of time and inconvenience by having it brought to their notice. My remarks on the matter are critical, but do not get the impression that my attitude is an intolerant one towards the novice; experience and knowledge are a matter of degree, and who knows but that I may be floored by some trouble quite as basically simple, some day.

Briefly, the engine, which was usually an easy starter, had gradually been getting hard to start, and finally refused to start at all. When cranked round, a hissing sound was heard. The induction pipe joints were tested and found to be sound; so the inlet valve was removed and ground in. On replacing it, the hissing still persisted, and compression was very poor. The exhaust valve was similarly treated, with no effect.

Some time later, an attempt was made again to start the engine, which, after some difficulty, was successful, and the running of the engine was found to be much improved. Each subsequent run showed an improvement, until the compression and engine performance gradually returned to normal. The reader has drawn certain conclusions regarding the source of the trouble and its disappearance, but asks for any other opinions.

A Tentative Diagnosis.

One must needs be cautious in venturing an opinion on second-hand data, and I am personally never inclined to give any guarantees with a long-distance diagnosis on an engine which is just described in its bare essentials. While the exhaust valve undoubtedly ranks as "suspect No. 1" in the case, there is just

a bare possibility that the leakage, which undoubtedly was the cause of all the trouble, may have been in a different place altogether. I have known very many cases, especially in model engines, where complete loss of compression has resulted by a speck of foreign matter getting into a piston ring groove, at

Valve Grinding Fallacies.

I would offer a mild criticism of that all-too-popular pastime of grinding in valves as a measure of correcting an undiagnosed fault. Even some trained mechanics have been known to regard this as a panacea for all ills that an engine is heir to, but actually it

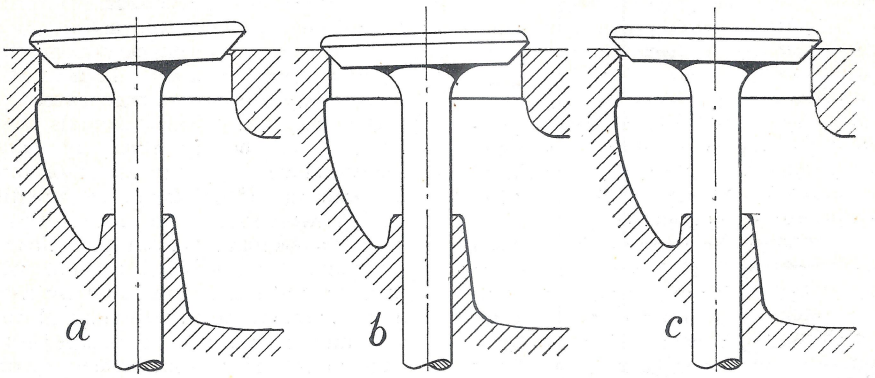


Fig. 1. In cases where either the valve or its seating are badly distorted (shown exaggerated at a) grinding in is liable, in spite of all precautions, to produce a false seal (b) with the valve in one position; in other positions the leak is as bad as ever (c).

the side of the ring, and either jamming the latter or making it very leaky. A fact which is not so fully realised as it deserves to be is that the side faces of the piston rings, and the corresponding sides of the grooves, are just as important as the outer circumference in relation to its fit against the cylinder wall. The trouble, if due to this cause, would be capable of putting itself right, if the foreign body became dislodged. As the engine is of the horizontal type, and presumably open, a hissing sound would be heard when the gas leaked past the piston on the compression stroke, though its location should have been fairly easy to detect in this case.

Then again, it is just possible that a decompressor, or similar fitting in the cylinder head, may have been giving trouble. Although such a thing seems too obvious for anyone to have been misled, I know cases where a leaky compression tap has fooled experienced mechanics. Another point which one sometimes incorrectly presumes must surely have been examined, is the valve operating gear; it is by no means impossible to have a valve held slightly off its seating, and I encountered a case some years ago in which a tappet became bent and worked round so that in one place there was negative clearance. Actually, I believe that on a certain make of motor cycle, having offset tappets, this fault was often known to occur.

The *prima facie* evidence, however, distinctly indicates the exhaust valve as the offender, and I do not think that the issue would have been long in doubt under a systematic examination. The fact of hearing a hissing sound was in itself evidence that the trouble emanated from gas leakage *from the cylinder*, somewhere, somehow; location could have been settled by very careful listening at all possible places, and cause settled by dismantling and examination of the component thus indicated.

should only be done when known to be necessary, and then with the greatest of discretion and understanding of its limitations as a means of restoring the valve and its seating to a perfect seal. The fact is that grinding in a valve

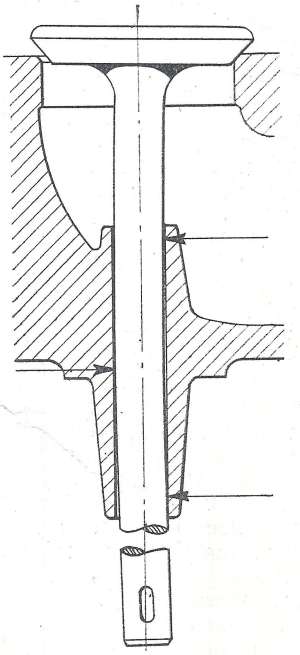


Fig.2. A bent valve stem may usually be detected by high spots where indicated by the arrows, and can be corrected by straightening.

does not necessarily true it up, and, in the case of a badly distorted valve, it is worse than useless. (See Fig. 1.)

Some years ago I had the job of overhauling a set of diesel engines which were known to have leaky valves, and as the job was very much in a hurry, the complete valve and cage

assemblies for the inlet and exhaust on each of six cylinders, twelve of them in all, were handed over to another mechanic for treatment. Although a lathe was available, this gentleman preferred to rely on his skill at the abrasive art—personally, I very much prefer twiddling the handles of a slide-rest to the exertion required to grind in large valves—and in due course, returned the complete set of valves and cages all beautifully ground in to a perfect unbroken "ring" on valves and seatings. When they were all assembled, however, the compression was as poor as ever, so they were again removed and tested by holding an inspection lamp inside the cage and aligning the eye with the angle of the seating. Nearly all of them showed streaks of light, proving that the valves and seatings were distorted.

The light-streak method cannot be so well adapted to testing small valves, but an equally good test can be made by making a few pencil marks across the valve, dropping it on its seating, and giving it a mere fraction of a turn. This should be repeated several times in different positions, and in every case *all* the pencil marks should be removed; if not, distortion is a certainty, and should be dealt with by re-machining or renewal. Stem distortion is practically always evidenced by high spots on one side of the stem (Fig. 2). A patch of hard carbon in the guide will sometimes force a valve over to one side and make it leaky; also a ridge caused by wear or carbon deposit may hold it off its seating. The smaller the valve, the more minute should be the inspection and test. It is fairly safe to say that the great majority of cases where a falling off of efficiency in small four-stroke engines is experienced are due to the valves or some part of their gear. Rockers may stick or operate erratically through uneven wear; springs may lose their temper or become distorted and bear unevenly against the collars, which in turn may not be true on the valve stems, through worn cotters, etc.

The reader will note that I have discreetly foreborne to offer any hints on the trouble one gets in the corresponding functions of an engine which has no valves, and should, therefore, be immune from such idiosyncrasies—but isn't! Really, there are few mysteries to compare with that presented by a two-stroke engine, which, for no reason at all, just doesn't go; and if I may be permitted just one more anecdote, I heard some time ago of a model engineer, whose knowledge and ability in respect of I.C. engines is beyond all question, who got stranded in the middle of a lake with an outboard engine. If such a tragedy as this allows of any consoling reflection at all, may I say that I am heartily thankful that I was not present to be consulted on how to get *that* engine started!

Cutting a 3 inch Hole in a Steel Plate

A CORRESPONDENT has asked us to give the correct method of cutting a 3″ hole in a piece of ½″ mild steel plate.

The method depends upon the size of the piece of ½″ steel plate in which it is necessary to bore the hole, and to some extent upon the shape of it. Further, it depends upon the capacity of the lathe to swing.

Assuming the piece of steel to be square, 4″ × 4″ × ⅜″, mark off upon it, by a centre punch dot, the centre of the 3″ hole, and from the dot scribe a circle of 3″ diameter on the steel. If an independent chuck is available, large enough to take 4″, set the four jaws in "lathe" position (i.e. with the highest step on the outside) and mount the job by its four sides in the outer steps and against the steps, touching all four sides. So set, the lathe must be of capacity to swing about 6″ or more over the point where the plate swings, to clear its corners. Set the job as near centre dot on the chuck centre as possible. Put the chuck in lathe and adjust its jaw settings till a rigid pointer held, say, on the tool plate of rest tallies with the 3″ scribed circle in one revolution, swinging the lathe by hand. When the circle runs truly, as also the centre dot, put, say, a ⅛″ twist drill in the chuck on tailstock and, running the lathe on single speed, drill a ⅛″ hole through it at the dot. It does not matter if this hole is not running truly. Now open out the hole to the largest it can be drilled, and from that hole, with an ordinary internal turning tool on double gear, internally turn it until it tallies with the circle, or measure accurately 3″ by internal slide gauge, or by internal callipers set accurately.

All the drilling, and a good deal of the internal turning can be cut out, by parting out the disc, using a specially cleared and shallow pointed parting tool, held parallel with the lathe axis, and fed in horizontally dead on lathe centre, working on double gear and using lubricant. A slight movement each way in the cross direction will keep the tool from digging in, but the final hole thus formed should be about ⅛″ less than 3″, and brought out to size by internal turning. This parting out will result in taking out a disc about 2½″ diameter, which will be more useful scrap than all the cuttings made by the other method, but practice is needed in preparing and using a parting tool in this manner. Care must be taken to ensure that in parting right through, and in the internal turning, not to foul the face of the chuck jaws. If there is any likelihood, set the work outward a bit in the first place, but make sure that it is held with its face running truly as to flat.

If the job is too large for the chuck, and can swing in the lathe gap, it could be held on the faceplate, backed by a piece of parallel thickness wood (preferably hardwood). In this case, at least three ⅝″ or ⅜″ holes drilled in it are needed, somewhere opposite the slots of the faceplate, and outside the 3″ bore, for the purpose of bolting it to the faceplate, and such holes would have to be so placed as to correspond roughly with the points of an equilateral triangle, and further would have to have clearance enough in the slots to set the job running truly to the marking off.

SHOPS, SHED & ROAD

A Column of "Live Steam."

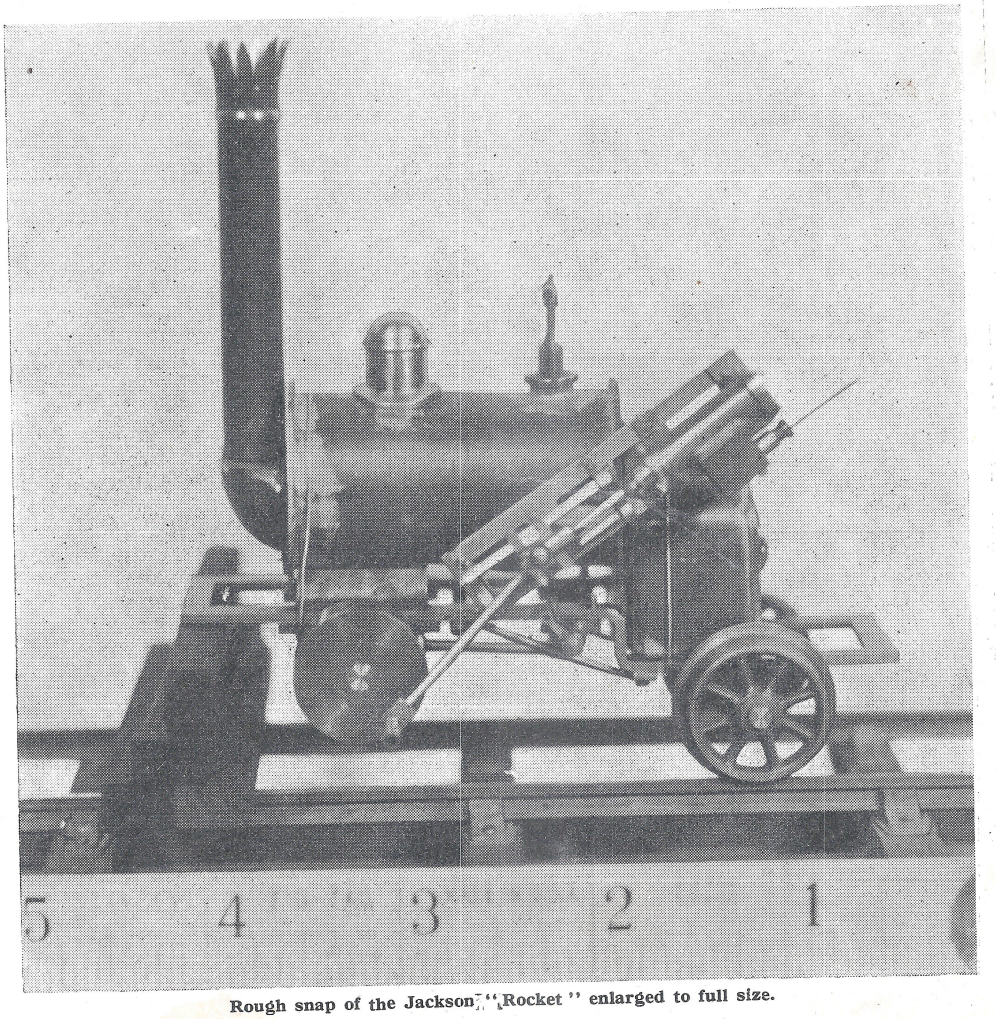
By "L. B. S. C."

An Echo of Rainhill.

Here is a picture of the baby "Rocket," one of the unfinished "O" gauge locomotives left by the late Mr. Steadman Jackson. Its present owner, Mr. W. Atkin, of Norwalk, Conn., U.S.A., intends to have a shot at completing the job himself, whilst friend Cooke gets busy on the second engine, the little "Cardean." I guess whoever finishes first, will be landed with the job of putting the third sister (G.W. "Gooch") on the road, and adding all the blobs and gadgets to that.

The dimensions of the "Rockette"—much more suitable name for her!—are next-door to being microscopic. The boiler barrel is 15/16″ diam. and 1¾″ long, and contains two tubes; the firebox is ⅝″ long, 1″ wide and 1″ high. The chimney is 5/16″ diam. and 2½″ long from bottom. The cylinders are 3/16″ bore, ½″ stroke, and have rings on the pistons, the rods being 3/64″ diam. The flat valves have 1/32″ spindles and are operated by very tiny loose eccentrics. Steam pipes are 1/16″ diam. Bro. Atkin says he intends to try his best to finish off the engine to the same standard of workmanship, and as near "scale" as possible, but the tiny dot will not have wood-spoked driving wheels, as these would be too fragile for an engine intended to work. The metal wheels will, however, be as near the correct pattern as he can make them.

He also says he intends to try and run the engine with a coal fire, even if it takes him weeks to learn how! I don't think there will be a great deal of difficulty. At first thought it seems a silly idea, to put it mildly, expecting to get a coal fire to burn in such a tiny firebox; but these "silly ideas" often have a peculiar knack of panning out O.K. For example, it may be remembered that your humble servant

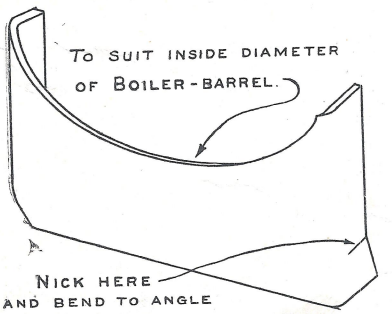


Rough snap of the Jackson "Rocket" enlarged to full size.

was once shown a "OO" gauge locomotive and chaffed about the "impossibility" of building a coal-fired boiler for it; but I had the last laugh after I made the boiler, and demonstrated it at the Caxton Hall! The fire not only lit up and burnt all right, but the boiler steamed from all cold in 1½ minutes. It was suitable for a "OO" gauge "Atlantic" locomotive, and had a barrel 1" diameter, two tubes, and a firebox ¾" square, the firebars being made from blanket pins; and it made steam enough to operate a stationary engine with a cylinder 5/16" bore and ½" stroke. On this showing, the "Rockette's" boiler, which has a wider firebox, should be able to steam all right if carefully fired.

"Maisie" (*contd.*) Boiler.

The "Atlantic" type of boiler is about the easiest to build, of all the locomotive-type boilers; "Maisie's" is, in fact, easier than the



Sketch of throatplate.

2½" gauge "Dyak" boiler. It is a plain straightforward job, the barrel and wrapper being all in one piece; the firebox can be bent to shape with the minimum of trouble, the tubes are symmetrically arranged and easy to set out, and last, but decidedly not least, you can get your fingers in the firebox to screw on the stay nuts and tighten them with a spanner. A five pint blow-lamp, or a gas blowpipe of ordinary type with a 1" nozzle, will do the needful as far as brazing-up is concerned. As for performance, with a grate area of approximately 19 square inches, plenty of firebox capacity and ample tube area, there will be bags of steam for the big cylinders under any condition of working. Despite the number of tubes, the crown of the firebox is only ⅜" above the centre line of the barrel, although it wouldn't matter a bean if it were higher. When an engine is fed by a pump, the water level can be kept practically constant, and the hoary old lamentations about restricted water range and so on, no longer count for anything at all.

The barrel and wrapper are formed from a single eighteen-inch length of 16 gauge seamless copper tube, 4⅜" diameter, the ends of which should be turned off square. Our advertisers usually supply boiler barrel tubes with turned ends, but tubes bought at the metal merchants will probably be rough sawn; so make certain, if purchasing from them, that you get a piece long enough to allow for turning the ends. This can be done in an ordinary lathe if the tube-ends are plugged with wood discs. Grip one end in chuck, support the other with tailstock centre, use a pointed tool with the end rounded off, and set it obliquely to the tube end. Use plenty of cutting oil, and traverse the tool back and forth with the cross slide, as you feed in slowly with the top slide. Turning tools are pretty fond of playing the goat and digging into soft copper if they get half a chance; but the double movement, if carefully wangled, will stop all their antics.

The throatplate is only sloped *below* the level of the bottom of the barrel; therefore the cross sawcut is made square across the barrel at exactly 5" from one end. Scribe a line right around the barrel, and saw carefully through a little over half the diameter, keeping strictly to the line. The longitudinal cut is made with the tube gripped in the vice, one of the wood plugs being pushed inside it to prevent distortion, and the part to be sawn is left overhanging. After sawing, heat the sawn part to dull red, and plunge into water; you will then be able to open out to shape with your fingers. Trim the sawn edges with a file. The slope for the throatplate is formed by marking off a point ⅝" from the front edge of the opened-out section, and another point 1⅛" up, on the edge. Draw a line between the two points, and snip off the triangular-shaped corner.

As you'll need the backhead former to form the throatplate on, better make this next. Saw and file it from a bit of ¼" iron or steel plate. Mine was done with the oxygen cutting blowpipe, which slithers through ¼" steel at a foot per minute (did I hear somebody say "Lend us it for 'American Annie's' frames?") but if you give your hacksaw plenty of cutting oil, you won't find it a very hard job to saw out the former. The plate is same shape as backhead, of course, but 3/32" smaller all around except bottom, to bring the flanged plate to right size. If you make the former 5⅛" wide at the bottom, and the rounded top to a radius of 2 1/16" full, it will be O.K.

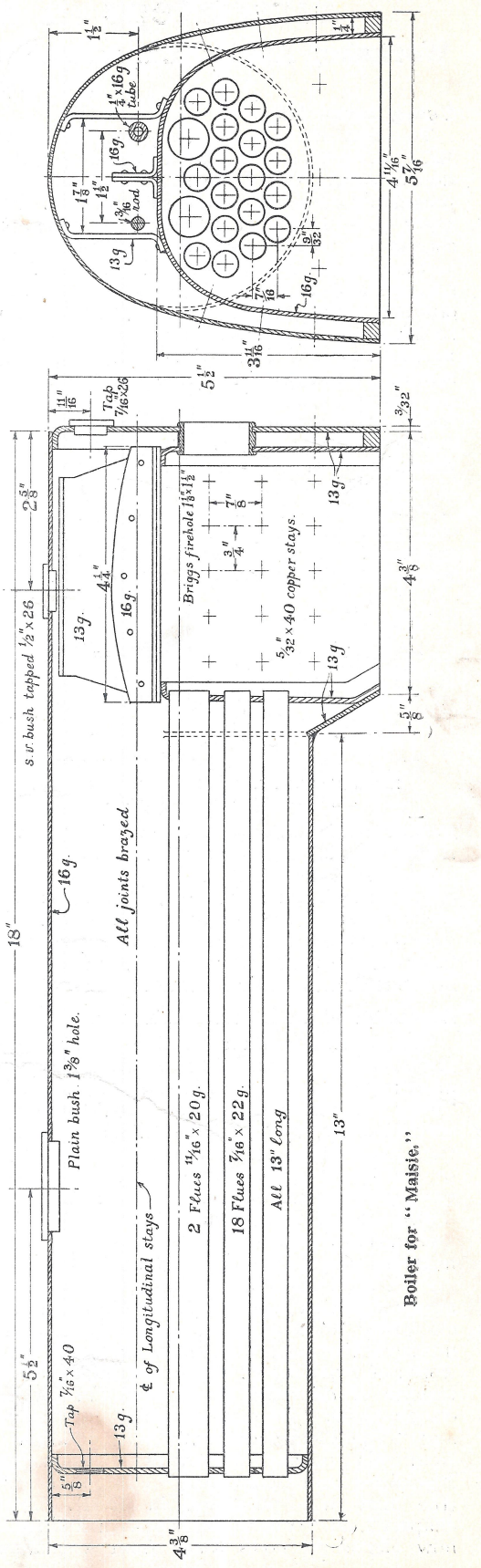
Cut a piece of 3/32" sheet copper to same shape as lower part of former plate, but ⅜" wider each side. The height of this piece should be 3¾". Anneal, clamp in vice alongside the former, and beat down the sides on to the edge of former. Put in place in the boiler barrel, and hold it there whilst you put a scriber down the barrel and scratch a line on the throatplate, flush with the inside. Also, make a mark on each flange, level with bottom of boiler barrel. Remove, saw and file out the curved piece, nick the flanges, and bend backward the bottom part of the plate to the same angle as the cut-away corners of the opened-out section of the boiler shell. The throatplate should now look like the sketch. Clean the flanges, and the edges of the shell, place in position, fix temporarily with a couple of toolmakers' clamps, and secure with a few 3/32" by ¼" roundhead copper rivets at ½" centres. Note—make certain the edge of the scalloped-out portion butts up hard against the edge of the barrel.

Now braze it in. Up-end the shell in a pan of coke, or breeze, piling up the coke level with the throatplate outside, and up to within an inch of it inside. Mix up some Boron compo to a creamy paste with water, slop it around

the joints with a brush, blow up to bright red, and apply some easy-running brazing strip, starting at one bottom corner of the throat-plate and going up to the barrel, then doing the other side. If you have sufficient heat, the spelter will run right through between the flange and the wrapper. Then go all around the curved joint between barrel and throatplate, applying plenty of brazing strip so that you get a nice spelter fillet all around. Pay particular attention to the top corners where the sawcuts end; run plenty of spelter in here. Dip the brazing strip into some dry Boron each time you apply it. There are no "secrets" in successful brazing, only simple precautions to observe, viz., the joints must be clear; you need plenty of flux (Boron is the best I have ever used); and last but not least *plenty of heat*, applied evenly. It is lack of heat which causes the "almond-rock" appearance of many amateur brazing jobs. Whilst the brazing strip is molten, and before you take away the blowlamp flame, scratch around the joint with a pointed wire. This acts like a soldering bit on a soft-tommy job, making the brazing metal go into every nook and cranny, and breaking up all borax blisters, preventing the formation of "pinholes" in the joints. I have dilated a little on this job, although it has been fully detailed out several times in back notes, because scarcely a week passes without a crop of queries relating to brazing jobs in general and boilers in particular.

Every boiler, after a brazing operation, and as soon as the red has died away, should be dumped into a "pickle bath" to clean it and remove burnt and glazed flux. The finest pickle bath you can have is an old wooden box lined with sheet lead about $\frac{1}{16}$" thickness, and the pickle is a solution of 1 part of commercial sulphuric acid to anything between 15 and 20 parts of water. *Put the acid into the water*, and *not* vice versa. That'll save needless correspondence from "L" card boilersmiths!

The next job is to make the firebox end plates, and for that you'll need another former, same shape as firebox but again 3/32" less all around except bottom, to allow for the finished plate being correct to size. This is also cut from $\frac{1}{4}$" steel plate. In addition to its legitimate job, it acts as a jig for setting out the tube holes in the firebox and smokebox tube-plates; so mark out very carefully on it, the location of the tubes. Note the following:—the locating point for the top centre tube, between the two superheater flues, is dead on the centre line and $\frac{5}{8}$" from the top of the former plate. With this as a guide, the others can easily be marked out, as they are 7/16" apart vertically, and 9/16" horizontally, see sketch, except the two end ones in the top row, and the two superheater flues, which can easily be set "by eye," or separately measured from the centre line. Make a heavy centre pop at each tube point, and drill a No. 40 hole clean through. Next cut out two plates of 3/32" sheet copper, $\frac{1}{4}$" larger than the former all around except at bottom; anneal, and carefully flange over the former, cleaning up the flanges, when formed, with a rough file. The file marks will, later on, form a "key" for the brazing material.



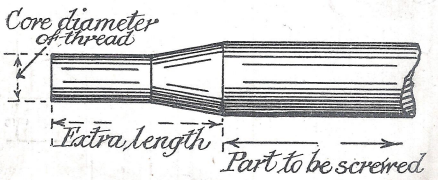
First Steps in Model Engineering.

Workshop Advice, Experience and Philosophy for Readers of all Ages.

By "INCHOMETER."

Using Screw Dies.

To assist understanding, my correspondent, Mr. F. C. R. Douton, included with his information a sketch, this I have re-drawn and now present by the accompanying illustration. The taper part should, I presume, be made to correspond, so far as can be readily observed, to that of the entering, or leading, end of the screwed hole in the die. Remember that all ordinary screws are "right hand," direction of rotating the die must be the same as the movement of the hands of a clock. If you are screwing a rod held in a lathe and holding the die stationary, the direction of rotation of the rod must be towards the front of the lathe, as in ordinary turning. With a "left hand" screw the direction of rotation will be in reverse, that is, contrary to that of the hands of a clock. Left hand thread screws are used only in special circumstances, but you should recognise their existence. Looking at a right hand screw, you will notice that the thread slants from right



Illustrating Mr. F. C. R. Douton's method of guiding a solid screwing die.

towards left hand, the converse will be observed if the screw is left hand thread. Do not apply excessive rotational force, if the die appears to require much turning effort, remove it and slightly reduce the diameter of the rod. Be very cautious with small sizes or you may twist off the part being screwed, it may stick in the die and be troublesome to remove.

Direction of an Electric Current.

The following communication from Bognor Regis has reached me, via the Editorial Department: "I am surprised to note in the article 'First Steps in Model Engineering,' 'Preparatory Electrics,' by 'Inchometer,' he states that the current flows from the positive terminal of the battery through the external circuit to the negative terminal of the battery. This was disproved by the thermionic value; it now being known that the reverse direction is correct, viz. negative to positive externally."

As I shall continue to adopt the generally used conception in practical electric work, that electricity flows as a current in positive to negative direction, I will give explanation by words of Sylvanus P. Thompson, famous as a teacher of electrical technology and for his classic books "Dynamo Electric Machinery" and "The Electromagnet." My quotation is from his book "Elementary Lessons in Electricity and Magnetism," edition of 1893 (the first was published in 1881). From chapter 3, on "It has already been mentioned—how electricity flows away from a charged body through any conducting substance, such as a wire or a netted string. If by any arrangement, electricity could be supplied to the body, just as fast as it flowed away, a continuous current would be produced. Such a current always flows through a conducting wire, if the ends are kept at different electric potentials. In like manner a current of heat flows through a rod of metal if the ends are kept at different temperatures, the flow being always from the high temperature to the lower. It is convenient to regard electricity as flowing from positive to negative; or, in other words, the direction of an electric current is from the high potential to the low. It is obvious that such a flow tends to bring both to one level of potential. The 'current' has sometimes been regarded as a double transfer of positive electricity in one direction, and of negative electricity in the opposite direction. The only evidence to support this very unnecessary supposition is the fact that, in the decomposition of liquids by the current, some of the elements are liberated at the point where the potential is highest, others at the point where it is lowest."

The foregoing expresses a convenient working hypothesis to explain phenomena of electric action in a conducting circuit. It should be regarded as such, is good reasoning and a simple guide. If also, you please to reckon that, in reality, current flows from negative to positive, through the circuit, this need not upset observance of the customary idea. Through my having presented to you his information, I trust Mr. "Bognor Regis" will consider this as an expression of thanks for interest in "First Steps"; though I remark that I do not fully endorse his conclusions.

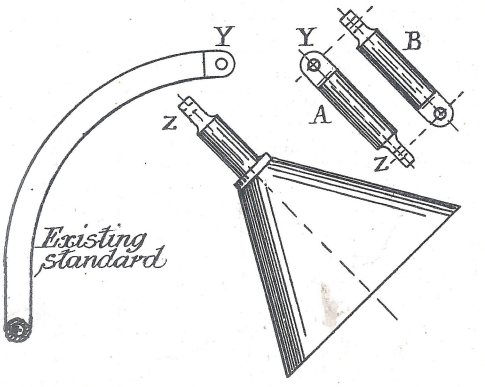
Improvement to the Electric Lamp Standard.

My correspondent at Rangoon has kindly sent a further communication relating to his suggested electric lamp standard, described, with a sketch, in the "M.E." of 14th November, 1935. Noticing the warning about possible shock, referred to in the 5th December issue, he remarks, "I contend that if the lamp is looked after, the danger is very remote. However, the following suggestion is given to allay any fears which may exist in the minds of some of your readers. The metallic parts of the lamp may be earthed, using a three core cable, or, if not available, a rubber covered flex taped to the outside of the usual lighting or workshop flex. A three-pin plug and socket would be ideal, but an earthed terminal alongside the usual two-pin socket would do. The above suggestion has two good features. One is the protection it affords the user, and the second is that if a 'short' does occur, the circuit fuse will blow and will continue to blow until the fault is cleared." He has introduced an additional joint piece to the original design, he regards it as being an improvement. The accompanying illustration is adapted from his rough sketch, it shows the new joint piece by

two views A and B ; this piece is made of tube, flattened at each end, drilled and fitted with a clamping bolt and nut, as indicated by the joint shown in the former drawing. Notice that the flats are at a right angle to one another. In fitting together, Y and Y mate together, and Z and Z mate together. The additional piece and joint allows the lamp and shade to be moved and clamped sideways as well as being moved up or down. This is the same correspondent to whom we are indebted for the idea and drawing of the small vice tray, illustrated in my article of 7th November last year, with desire to help the " lame dog." Having word from him again, and help towards my articles, coupled with an interesting comment about " chits " (my jocularity concerning these), affords me exceptional pleasure and gratitude. In return, my offering, with sincerity, is the sentiment " hands across the sea." If any reader has made one of the lamp standards, I am sure that he would desire to know, with particulars of the maker's views of its utility and experience in making.

Grinding Twist Drills.

My apology to a model engineer residing in Kettering, for delay in writing a reply to his courteously related difficulty and adventures with a twist drill grinding jig appliance. This delay has partly evolved by my desire to compare his second letter with one sent at a previous date, apparently lost but now discovered. The enquiry has been passed on to myself through his request and mention of my articles. He bought the jig from a well known trade firm dealing in tools and machines, he has not been able to obtain satisfactory grinding of twist drills by its use. He has studied the printed directions and consulted an engineer friend who gave to him a demonstration with an automatic twist drill grinding machine, but could not try the jig in question as a grinder was not available. This friend was unable to see how correct grinding could be effected with it. My correspondent is unable to get a correct cutting edge, he gets backing off " the wrong way round," and fears that he has bought a useless appliance. The printed directions are lengthy and impracticable to grasp mentally without the actual jig is alongside. The failure may be due to unsuitable length of projection of a drill from a supporting trough. Quoting the instructions " Remember ; more projection, less backing off : less projection, more backing off." One may logically presume that an appliance established on the commercial market, intended to give proper results, and vended by a reputable trade firm, has been thought out and well tried by its designer. My advice to Mr. "Kettering" : believe in the appliance, put aside all prejudice you may so far have acquired, determine to get useful results. You may not obtain perfect grinding with an accessory device, but such results will be equal to or superior to grinding by hand only, and more conveniently obtained. My procedure would be to experiment with pieces of steel rod, various diameters, various positions on the grinding wheel and lengths of projection, until I had investigated the range of movements given by the jig and obtained a thorough understanding of its action. A " counsel of perfection " ; it is easy to offer advice, so I will relate a story given to me as fact. An inventor of an appliance for sharpening twist drills found difficulty in obtaining uniform results. He decided to investigate drills, bought samples of all different makes of which he could obtain knowledge, and discovered, by examining them, that different makers varied in the pattern, twist and shape of the grooves. Regard possible difference in drills as a factor to consider ; observe that in research experimenting, one should change, or alter one factor only at a time.



Additional joint to Electric Lamp Standard.

Another excerpt from the printed directions : " The trough should be lifted off the arm occasionally to inspect progress and to make any required alteration in the projection of the drill to get correct backing off." My regards to Mr. " Kettering " and appreciation for his kind mention, perhaps he will let me know about his further attempts with the grinding jig. Comment and suggestion from an expert in twist drills and grinding will be very welcome.

For the Bookshelf.

The Young Engineer. By J. N. Digues la Touche. (London : The Technical Press, Ltd.). Price 5s. nett, postage 3d.

This book is intended to aid the young civil engineer to begin his career with some knowledge of the everyday details connected with his work. The theoretical side of the subject is scarcely touched upon ; only practical matter is dealt with. The author has had very wide experience as a Mechanical and Civil Engineer in India, and it is particularly to those about to commence engineering careers in that country that he addresses himself. Nevertheless, a great deal of the information and advice here given should prove invaluable to all concerned. The subjects dealt with are many and various, covered by twenty chapters, each with a subject to itself. The lucid and informative style of writing, maintained throughout the book, holds the readers' attention and interest, and adds considerably to the utility of this handy little volume. We recommend the book to all who are about to embark on a career connected with Roads, Railways or other Public Works.

A Small Filing or Jig-Sawing Machine

By GEO. GENTRY

THIS apparatus is one of the latest additions to the "Eureka" series of small machines, designed and made by Mr. J. B. S. Poyser, of Pecks Hill, Mansfield, Notts. Mr. Poyser is prepared to supply this machine complete, or in the form of castings and parts, together with a drawing, from which purchasers can construct their own machines.

Fig. 1 illustrates the design as a whole, and Fig. 2 is a sectional elevation showing the assembled construction in a view made up from the detailed drawing supplied, and amplifying, in some respects, of those details for the benefit of any intending builders.

It is a small 1½" stroke filing or jig-sawing machine, made up of a cast iron frame, carrying an actuating spindle running horizontally in a long boss bearing in and across the vertical member of the frame. This spindle carries fast and loose pulley gear with a fork shipper at one end and a disc crank, actuating a vertical reciprocating shaft, at the other. The upper end of the frame carries a hinge block, adjustable for height, which, in turn, supports adjustably as to angularity, a 7¾" square cast iron table. Through a clearance hole in this table, files or saws are reciprocatively operated by the vertical shaft, to the top of which they are chucked for the purpose. The table, which appears by the drawings to be ⅜" thick, has cast to it, on the under side, a pair of lugs 1½" apart. These lugs are on one edge and centrally placed, are machine holed in line, one ¾" and one ½". The pocket between lugs takes the top of hinge block, and pivots upon the same by means of a ½" turned steel bolt. The ¾" head of this bolt runs free in one lug, but by its shoulder, grips the hinge block end on, and secures it by nut action to the other lug, friction tight, and thus holds the table horizontal or to a tilt of 15°, or less, either way of the horizontal.

The vertical shaft is not a spindle, but carries a cast iron split and cross slotted crosshead, adjustable for position. This head is indicated in plan in the inset view top right of Fig. 2. The cross slot is ⅝" wide by approximately ½" deep, and right across, and is machined to take a nice sliding fit, a die block of case-hardened steel, 1" long and cross holed centrally ½" to take a hardened crank pin. The pin wheel is permanently set in crank to ¾" throw, thus operates the shaft to 1½" stroke, which then acts as a ram. The top head of the ram is fitted with a steel or cast iron loose collar which has a sloping hipped bottom acting as a fender for chips and cuttings which may fall, and thus fends them off the top shaft bearing.

The vertical shaft is housed in a top bearing in a projecting bracket above the crank, and is supported, at bottom, in the solid base. In order to protect both the crank slot and base bearing also, from falling filings or cuttings debris, the top of top bracket is clothed with a fan shaped half circular thin metal pent, which is of sheet metal, angled upward, and holed to be clipped by the bolt of the hinge block. Such debris as falls from the head fender is caught by the fixed pent, and distributed over its edges wide of all running parts.

Referring again to the head end of the ram, this is holed concentrically down 5/16" bore by 1⅛" deep, and, at about ¼" from the top, is radially drilled and tapped through both the collar and shaft to take ¼" set screws. These both grip and centralize the shank of standard "Grobet" machine files (one of which the writer has by him and has shown in position). These files are made to cut downwards, and therefore do the work against the supporting surface of the table. The file shown has a 6½ m/m shank (a full ¼"), but if they are also made 7 m/m they would fit the 5/16" bore still freely, but with rather less clearance. No doubt also the 6½ m/m square shank files if cleared on the corners, would just fit a 5/16" clearing hole, and perhaps that is why Mr. P. makes the bore the size he does.

Referring again to the driving gear, the fast or driving pulley is given as 3⅞" diameter over the crown, and, being finished to 1½" width, will take at least a 1¼" belt. The loose pully on the outside is finished ¼" less in diameter so to take the unshipped belt on the slack. The latter is housed in by a grub keyed loose collar. How the fast pulley is keyed is not clear, but it apparently has a grub- or set-screw angularly tapped through its boss. The disc crank, as seen, is fixed on a shouldered nose, ⅝" diameter and ⅝" long, and no doubt is a fair driving fit. It could be keyed with an end on grub-screw half in shaft and half in shank, but

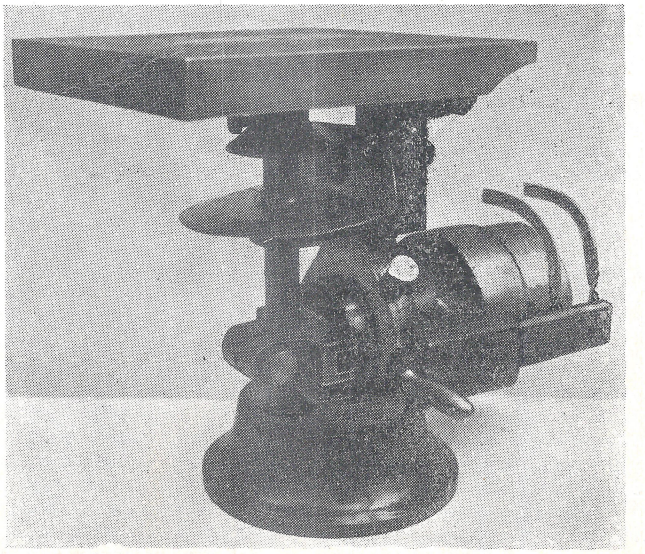


Fig. 1. The "Eureka" Filing Machine.

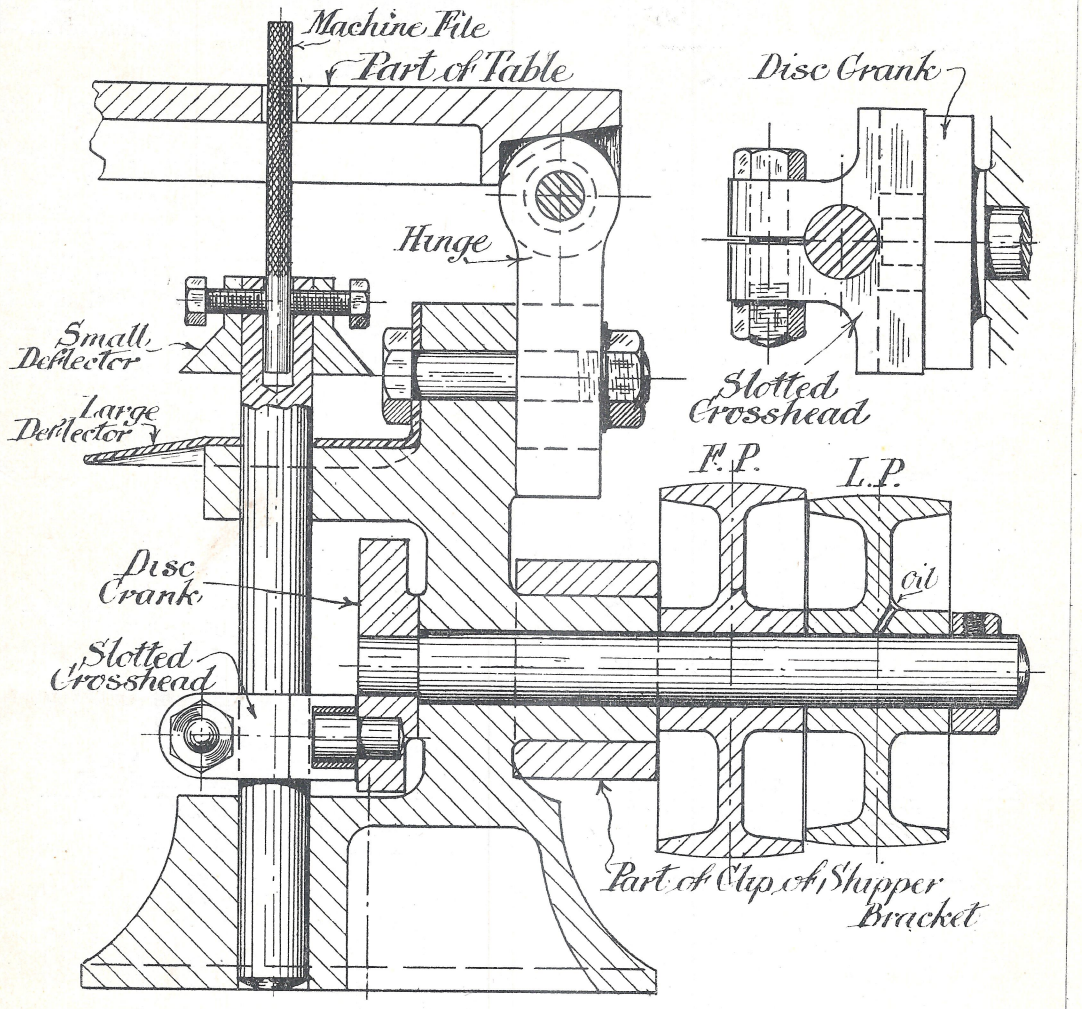


Fig. 2. Scale sectional elevation of the "Eureka" Filing Machine (half full size).

this must be finished either flush or under flush, because the face of crosshead slot must nearly bear on the flat face of crank, in order to act as a guide to the ram, which should not be capable of part revolution, especially in flat filing or in jig,sawing.

The belt shipper is best seen in the photo Fig. 1, as only part of its bracket clip is seen in section in the drawing, Fig. 2. The belt shipper bar of 1″ × ¼″ mild steel slides in a slotted bracket, which is on a stiffened projection, and in one with a split 1½″ bored ring clip. This ring fits on the 1½″ (turned ?) projection of the bearing boss of the driving shaft, on its outside, and it is this ring which is indicated in section in Fig. 2. On its further side it is radially split and fitted with wing lugs, through which a ⅜″ bolt is reeved, and thus, by tightening, clips the bearing boss in any adjusted position. By this, the fork gear can be put to any of four positions to adapt down, up, or angular drive.

The weight of this little machine is about 30 lbs., and its price complete, 5 guineas. Sets of castings, parts and drawing, are 21s. Mr. Poyser can supply the files extra in a variety of shapes. All operations are computed to be within a 3½″ lathe capacity, except the planing of the table and boring, the main casting for both ram and crank shaft, and possibly turning the boss (if it is turned). These latter operations can be carried out at a nominal cost of 6s. 6d. The recommended speed of the crank is 600 r.p.m.

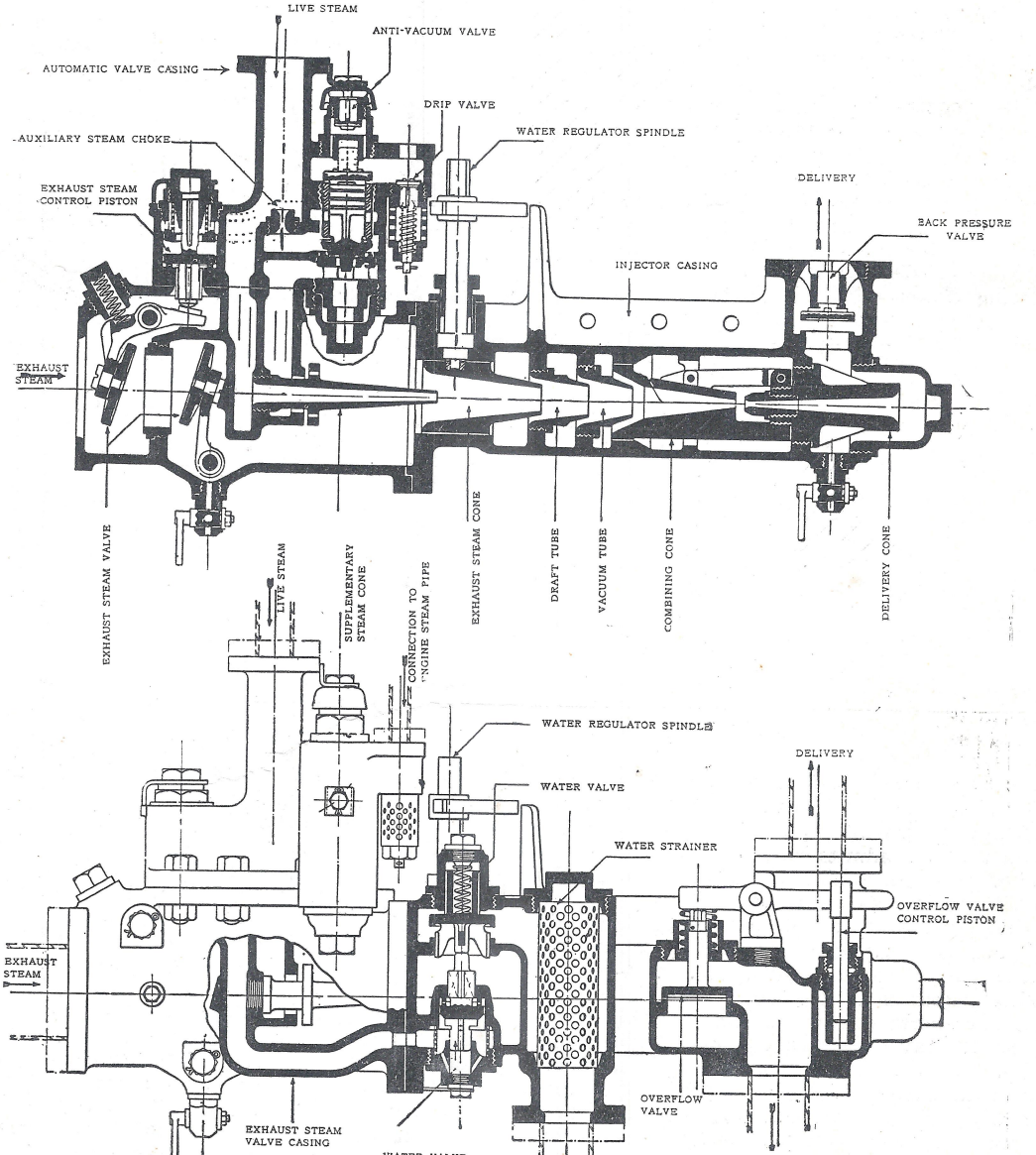
As is usual with these specialities of Mr. Poyser's, simplicity is the keynote of design, and one would conclude that readers would find this little tool both useful as a workshop adjunct and also a very interesting job in the making.

LOCO. PROTOTYPES NEWS and NOTES

By CHAS. S. LAKE, A.M.I.Mech.E., M.Inst.L.E.

Exhaust Steam Injectors.

It will be remembered that in a previous issue of the "M.E." reference was made to the enquiries the writer had received on the subject of exhaust steam injectors for locomotives. Since then, however, further enquiries have come to hand, and the desire has been expressed for a short description of the working of this type of injector together, if possible, with a drawing showing the general arrangement of the parts. Briefly, it may be stated that the exhaust steam injector is a feed water heater similar in principle to the live steam injector, except that it utilises, as its name implies, exhaust steam from the cylinders to heat the feed water and force it into the boiler. Until comparatively recently, injectors of this type were provided with hand controls, but in the latest type, known as the Davies and Metcalfe Class H exhaust steam injector, automatic control valves are fitted and the operation of the injector, is, as a result, much more simple. The injector is fitted with self-contained exhaust steam admission valves,



water inlet valves, auxiliary live steam valve and overflow valve which function automatically and require no attention. The injector is started by one operation only, namely, the opening of the valve to admit live steam, the only other manipulation necessary being the adjustment, when required, of the water regulator to vary the quantity of feed water supplied to the boiler. The injector functions as a feed water heater so long as the locomotive is using steam, and when the main regulator valve is closed, it operates with live steam, automatically changing from exhaust to live steam working when the regulator is closed, and back to exhaust steam working when the regulator is again opened. This automatic change-over is controlled by the pressure in the steam pipe acting on an automatic valve which shuts off the auxiliary steam supply when exhaust steam is available.

The exhaust injector consists of three sections, namely, the injector. the exhaust valve and the automatic valve casings, which are bolted together to form one unit. The injector casing contains the injector cones, the overflow valve, the back pressure valve and the water and delivery connections. The exhaust valve casing houses the exhaust steam inlet, the automatic exhaust valves, the supplementary live steam cone and the auxiliary live steam nozzle, whilst the automatic valve casing contains the automatic shuttle valve, the exhaust valve control piston and the inlet connection for live steam to operate the injector.

How It Works.

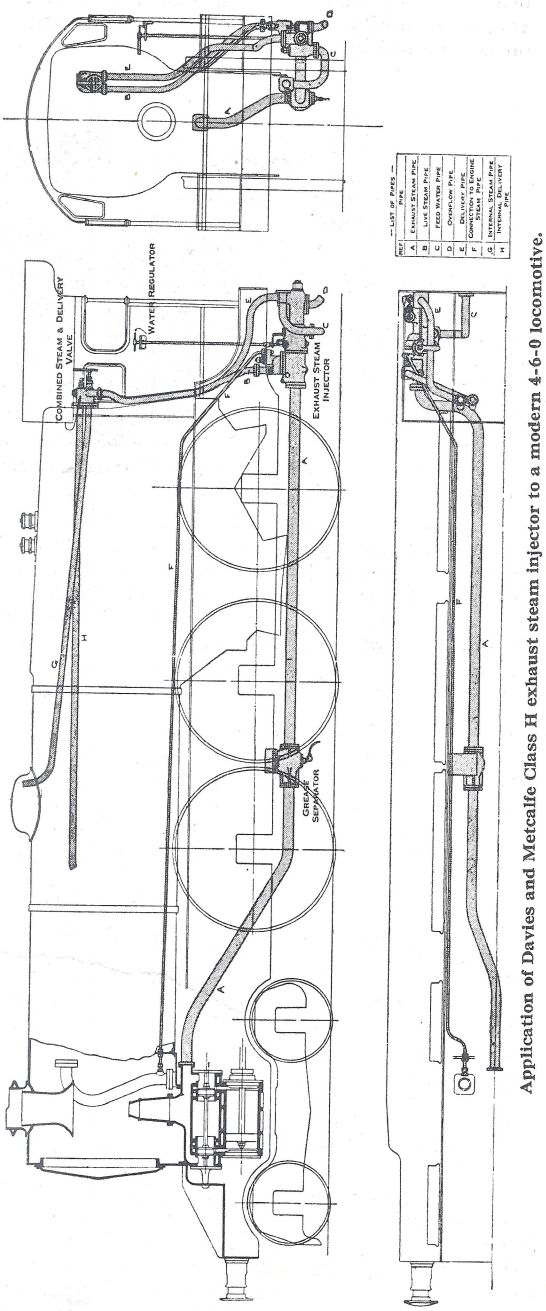
Perhaps the best way to explain briefly, and as clearly as possible, the names of the parts and the manner in which they function will be that adopted below, which provides essentially all the particulars required.

The *supplementary live steam cone* admits a small supply of live steam for the purpose of increasing the delivery pressure, and the *auxiliary exhaust nozzle* admits live steam to work the injector when the regulator is shut and exhaust steam is not available. The *exhaust steam cone* admits the primary supply of exhaust steam, and this cone guides and steadies the incoming jet of steam and regulates, by its bore, the quantity admitted. Next the *draft tube* admits and guides the flow of water to meet the primary exhaust steam supply at the mouth of the *exhaust steam cone*, and the *vacuum tube* admits the secondary supply of exhaust steam to meet the mixture flowing out of the *draft tube*. The mixture of steam and water passes out of the *vacuum tube* into the combining cone where condensation is completed, and finally the jet leaving the *combining cone* passes into the *delivery cone* where its kinetic energy is changed into pressure energy. The jet leaves the *delivery cone* at a pressure higher than the boiler pressure, and then flows past the *back pressure valve* into the *delivery pipe* and so to the boiler. This description, if read together with the sectional drawings reproduced, will, it is thought, make matters quite clear.

The general arrangement drawing, also reproduced, shows the apparatus as applied to a modern 4–6–0 type passenger locomotive. From this, the location of the various parts can be easily gathered.

A Turbo Locomotive Query.

A Birmingham correspondent asks for information respecting the turbine driven locomotive of the London Midland and Scottish

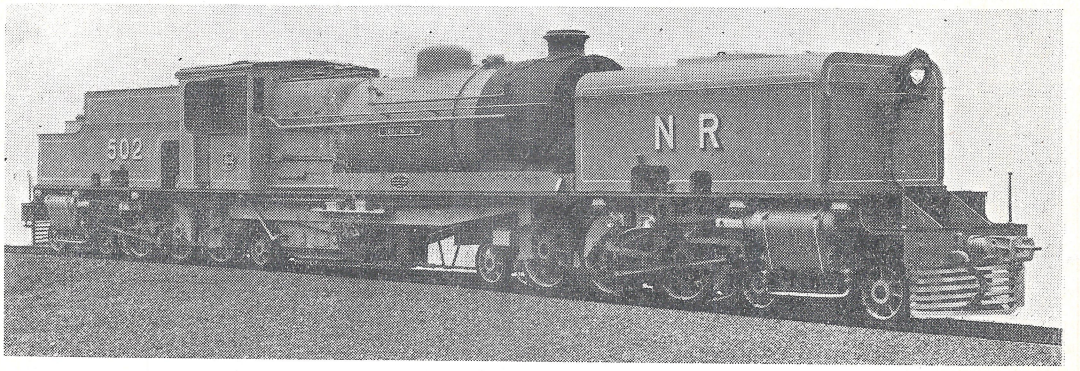


Application of Davies and Metcalfe Class H exhaust steam injector to a modern 4-6-0 locomotive.

Railway. He has heard that consequent upon a "major defect," it has been withdrawn from service and is now under "heavy repair."

This is by no means accurate. It was found that the locomotive would gain in efficiency by fitting a new and larger reverse turbine, and this has now been done together with a slight alteration in the geared mechanism. The

locomotive, which has now returned to service, has completed something like 6,000 to 8,000 miles of running, included in which are some remarkably good individual examples of working. On one occasion, it hauled a train of over 300 tons behind the tender from Rugby to passing Willesden, 77 miles, in 59 minutes, thus averaging a little over 77 m.p.h. With heavier loads, the engine has also given some very good results, both in respect of haulage and on economical grounds.



4-6-2 + 2-6-4 Garratt locomotive for the Nigerian Railway.

New Garrett Locomotives for Nigeria.

The writer recently had an opportunity of inspecting at the builder's works in Manchester, some new 4–6–2 + 2–6–4 type Garratt locomotives of special design for the Nigerian Railway, one of these being illustrated herewith. The engines have been built to provide a high tractive effort whilst conforming to the requirements of a light rail section. There are many miles of the Nigerian Railway laid with 45 lb. rails, having at each end of the section other distances laid with heavier rails. A very close investigation was made with the object of determining what was the best method to be adopted, seeing that heavier and more powerful locomotives were required, and finally it was decided to employ Garratt locomotives, each having a tractive effort of 33,600 lb. and an axle load not exceeding 9¾ tons. Owing to the light track, there are numerous bridges which demanded that the low axle weight should not be exceeded, and as the track and bridges were in good condition, any system of reconstruction with heavier rails was considered inadvisable.

The new Beyer Garratt engines each weigh approximately 112 tons in working order. All four engines are designed for 225 lb. boiler pressure, which, incidentally, is the highest yet adopted in Colonial Railway practice. Two of them, will, however, be arranged for 200 lb. pressure, and have 13¼ in. by 26 in. cylinders, whilst those with 225 lb. steam pressure will have 12¾ in. by 26 in. cylinders. When the engines have been in regular service for some time, it will be possible to decide which of the two boiler pressures will be maintained, and the cylinders can be either lined up or rebored according to which is adopted.

There are other alternative features, one of them being the difference in the draft arrangements of the locomotives, two of them, that is, one with 200 lb. and the other with 225 lb. boiler pressure are fitted with the Kylchap draught arrangement, and the other two with a "jumper-top" blast pipe cap.

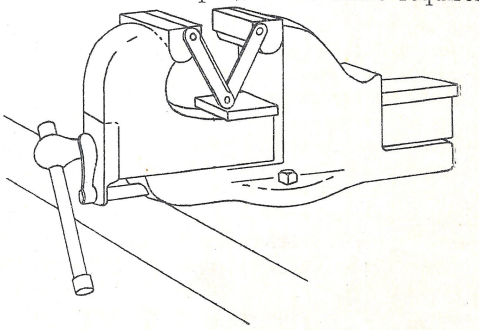
The principal particulars are as follows:—

Cylinders, diam. (2 engines)	12¾in.
Cylinders, diam. (2 engines)	13¼in.
Piston stroke	26in.
Wheels (coupled) diam.	4ft. 0in.
Wheels (truck) diam.	2ft. 4½in.
Wheelbase rigid (each group)	8ft. 10½in.
Total wheelbase overall	67ft. 6¾in.
Boiler steam pressure (2 engines)	200lb.
Boiler steam pressure (2 engines)	225lb.
Total Heating Surface	1,844 sq. ft.
Grate area	31.6 ,,
Tractive effort	33,600lb.
Wt. of engine in working order	111½ tons

These are mixed traffic engines capable of handling ordinary eight-coupled engine loads from the 55 and 60 lb. rail sections adjoining the 45 lb. section. A ten-coupled design was considered at one time, but this was thought to be impossible in view of the number of bridges to be negotiated and their condition, whilst in addition, the flexibility of wheelbase of the Garratt, and the greater length of the wheel base over which to distribute the weight, constituted another advantage.

A Snip Attachment for the Vice.

This consists of two hardened steel blades pivoted one to each jaw and riveted or bolted together at the bottom so as to slide over each other without play. One blade requires



to be packed away from the jaw a little in order to do this.

It is rare that this little vice snip interferes with the ordinary work of the vice, especially in model work. For snipping wire and strip stock it will prove a time-saver. S. GRANT.

Model Aeronautics.

Society of Model Aeronautical Engineers.

Annual General Meeting.

The annual general meeting was held at the Y.M.C.A., Tottenham Court Road, London, on January 16th. The chair was taken by the President, Dr. A. P. Thurston, M.I.M.E., F.R.Ae.S., etc., and later by Mr. B. K. Johnson.

An interesting report of the past year's activities was given by the Hon. Sec., Mr. E. F. H. Cosh. Competitions had been well supported, particularly the seaplane contest for the Lady Shelley cup, which attracted 25 entries. The Wakefield cup contest was held in splendid weather at Fairey's Great West Aerodrome, on August 5th. Australia and the United States sent models to be flown by proxy, and France sent a team of men and machines. The cup was won for Amercia by Mr. Gordon S. Light, with a flight of 7 minutes "out of sight," the model actually remaining aloft for 2 hours 20 minutes, and eventually landing at Hanworth Aerodrome. Mr. J. B. Allman won second place for Great Britain, and Mons. Vincre secured third place for France. The hope was expressed that the fund opened to raise the expenses entailed in sending a British team of men and models to America this June to retrieve the cup would be well supported, and that the prospect of a trip across the Atlantic, with all expenses paid, would induce many aeromodellists to enter for the Eliminating Trials which will decide the team.

The National Cup Contest was also favoured with good weather and numerous entries, and was won for The Model Aircraft Club by Mr. J. Worden. The autogiro hand-launched record had been advanced to 37 seconds by Mr. S. R. Crow, an Autogiro R.O.G. record of 18.5 seconds had been set up by Mr. L. B. Mawby, and an Ornithopter record of 16.75 seconds established by Mr. J. C. Smith.

Thanks were due to the technical Press for valuable support. It was pleasing to record that more technical journals were now devoting regular space to model aeronautics, including club notices and reports.

The report of the Hon. Treasurer, Mr. W. E. Evans, was encouraging. A deficit of long standing had been reduced to £5 18s. 8d., and Dr. Thurston generously undertook to clear this amount, thus enabling the newly-constituted S.M.A.E. to begin its career unhandicapped.

It was reported that Mr. F. R. Barnard had offered to present a cup to be awarded for the best average in the Wakefield Cup Eliminating Trials, with a small replica to be retained permanently by the winner. This kind offer was gratefully accepted.

The Midland Model Aircraft Club's application for affiliation was approved.

The S.M.A.E. Reorganisation Scheme.

The scheme of reorganisation of the S.M.A.E., which had been prepared with the object of broadening the scope of the Society's activities, and furthering progress, was submitted to the meeting, and passed without a single dissentient vote. Under this scheme, which came into operation immediately, the S.M.A.E. ceased to function as a competitive club, and will devote itself to its work of controlling model aeronautics in Great Britain, under its mandate from the Royal Aero Club.

There are three types of membership :—

(1) *Fellows*, to be elected individually by the Council in recognition of outstanding service to the S.M.A.E. (There are 4 existing Fellows, and it is proposed to bring the number up to 9). (2) *Patron Members*, consisting of those people who care to pay the previously existing subscription, but without the right to take part in competitions by virtue of such membership. (3) *Affiliated Clubs* (not individual members of same). No Fellow or Patron Member is eligible for competitions, except as a member of an affiliated or unaffiliated club, paying the appropriate entrance fee.

The Council is to consist of one delegate elected annually by each affiliated club, and four Fellows, to be chosen by all the Fellows. The Council will have power to co-opt up to four additional members, drawn from any suitable source.

Certain competitions will be held on some central ground, as now. Others will be held simultaneously on the official ground of each affiliated club desiring to take part. Results are to be sent to headquarters, and the winners will then be announced. The whole competition system will be reviewed at the end of the year.

The Affiliation Fee for Clubs is to be at the rate of 1/- per member, the minimum amount to be paid being 10/-, and the maximum £3 3s.

1936 Competitions.

The following contests were decided upon :—

*April 12, Pilcher Cup (Wakefield Cup rules).

*May 3, Gamage Cup. May 17, Eliminating Trials for the Wakefield Cup and Admiral Moffett Trophy contests, at Fairey's Aerodrome. May 31, "Flight" Cup (Speed).

*June 14, "Model Engineer" Cup (Gliding). June 28, Lady Shelley Cup (Seaplanes).

*July 12, C.S.S.A. Ciup (Scale Models).

August 2, National Cup. August 3, Sir John Shelley Cup (Power).

*August 23, and *Sept. 6, contests of a nature not yet decided.

The contests marked with an asterisk to be held on the grounds of affiliated clubs, the others to be held centrally, on grounds to be announced.

The entrance fees, payable to the S.M.A.E., are as follows for all contests : Non-members, 2/6. Members of affiliated clubs, 1/-. Juniors (16 and under), 6d.

Election of Officers.

The following appointments were made:—President, Dr. A. P. Thurston, M.I.M.E., F.R.Ae.S., etc.; Vice-Presidents, Messrs. G. Geoffrey-Smith, M.B.E., and A. F. Houlberg. Chairman, Mr. B. K. Johnson; Vice-Chairman, Mr. R. N. Bullock; Hon. Sec., Mr. E. F. H. Cosh (pro tem.). The Council was authorised to elect a new Secretary in 3 months' time, Mr. Cosh being unable to serve beyond that time. Hon. Treasurer, Mr. W. E. Evans; Competition Secretary, Mr. J. C. Smith; Technical Secretary, Mr. R. N. Bullock.

Instead of accepting re-appointment as Competition Reports Secretary, Mr. Knight suggested that in view of the wider facilities now offered by the Press, the question of publicity in its fullest bearings should be discussed by the Council, which should be empowered to make such appointment or appointments as found desirable. This proposal was adopted.

M. R. KNIGHT,
for the Council of S.M.A.E.

The Park Model Aircraft League.

The fifth annual general meeting of the P.M.A.L. was held on February 5th, the following being the principal officers elected for the year: President, Mr. R. T. S. Gillett; Vice-President and Competition Secretary, Mr. F. J. Saul; Hon. Treasurer, Mr. G. S. Broadway; Hon. Organising Secretary, Mr. H. W. King; Hon. Secretary, Mr. F. H. Dillistone; Assistant Secretary, Mr. K. W. Hetzel.

On Wednesday, February 12th, the second annual dance of the P.M.A.L. was held at the Farnan Hall, Streatham. Over 90 members and friends were present and the whole evening was voted a most successful and enjoyable one.

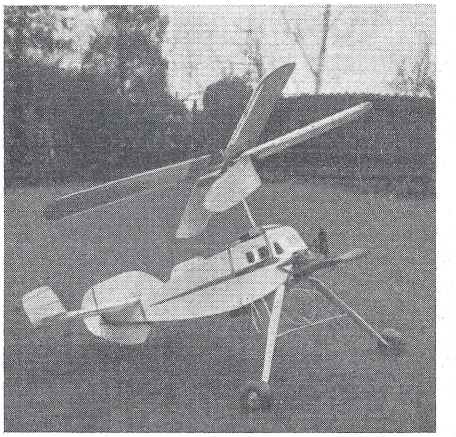
The exhibition of models also created considerable interest. Although the number on show was less than last year, the excellence of workmanship, finish and variety of types amply made up for the lack of quantity. The prize in the Concours d'Elegance event went to a 14 year old member, G. Robinson, of Mitcham, for his flying scale model Fokker D7. Other types on show included a 1 in. scale flying D.H. Comet, a 7 ft. wing span cabin compressed-air driven biplane, a free-lance rubber-driven air liner, general duration models of numerous types and a number of scale non-flying models. The loan section included a beautifully built and finished scale model D.H. Rapide, by Mr. Banks, of the Hayes and District Club, a "Grayspec" aero engine and set of castings, etc. Mr. Banks kindly acted as judge of the competition models.

Hon. Secretary, F. H. DILLISTONE, 112, Rodenhurst Road, Clapham Park, S.W.4.

A Petrol-driven Model Autogiro.

DEAR SIR,—You may be interested in the enclosed photo. of a petrol driven model autogiro that I have recently completed. My first petrol autogiro was, unfortunately, accidentally destroyed by fire in a few seconds.

This new model is the result of the experience gained, but is unlikely to undergo its flying tests until the weather is better and the days longer so that I can take it out to my flying ground some miles away. I have, however, tried gliding tests and found that it will glide without any tendency for the advancing rotor blades to turn the model over, due to increased lift on one side generated by forward motion. This was my chief difficulty on my original autogiro which was fitted with long blades with a narrow chord. I have now designed the whole model so that the centre of resistance of the blades is as near the rotor head as possible, and have kept my C.G. very low. I have now only to compete with engine thrust and torque, and I hope that I may have overcome, or at least be on the correct track of overcoming, these difficulties in the design. But only tests will prove this. On the full-



sized machine, of course, the lateral stability of the rotor system is chiefly ensured by the vertical hinges and therefore, flapping of the rotors, in conjunction with a low C. of G. whilst the engine torque is dealt with by the incorporation of a lifting tail on one side and an anti-lift section on the other. I do not consider this method is altogether desirable on a model, and my experiments so far have borne this out. I feel that in conjunction with a *certain amount* of flapping allowed on the rotors (as in my model) a small rotor span with greater chord is more likely to look after lateral stability.

It has often been the tendency in models to copy the full-sized machine, i.e., with blades of high aspect ratio and large span. These are necessary on the full-sized machine for the purpose of performance, but neither necessary nor desirable on the model which merely requires stable and slow flight.

Yours faithfully,
Birmingham. C. E. BOWDEN.

MODEL MARINE NOTES

The Altrincham Model Power Boat Club Exhibition.

A VERY successful exhibition was held on January 17th and 18th in the "Florence Beckett Lecture Hall" of the Altrincham Public Library and, during the short time of two days, upwards of 200 visitors were recorded. This was considered excellent in view of the exceptionally severe weather at that time.

The exhibition is believed to have been the first purely power boat one ever held in this area, and undoubtedly attracted attention over a wide radius. As the first effort of a comparatively young club, we are gratified by the results.

A varied array of models emphasised the diversity of activities among our members, petrol, steam and electricity being represented in the different power plants.

Nearly 40 individual exhibits were on view, together with numerous photographs and drawings. The various cups, medals and trophies held by different members were also shown with reference cards indicating the particular member and boat in each case.

The illustration gives a general view of some of the models displayed and the following is a detailed description of all exhibits:—

RACING CRAFT:

Mr. W. Tomkinson—"Rene II," 30 c.c. 4-stroke hydroplane, holder of the "M.E." Class B 1935 silver medal, and a 1934 bronze medal.

Mr. D. Innes—"Satellite I," 15 c.c. 4-stroke hydro., holder of the "M.E." Class C 1935 silver medal.

Messrs. G. and J. Barrow—"Spitfire," 30 c.c. 4-stroke hydro., winner of the Fleetwood Club's "Booth" cup for speed, 1935. Incidentally, we won this cup in 1934 as well, Mr. Tomkinson being the lucky one on that occasion.

Mr. H. Wraith—"Another Mistake," 30 c.c. hydro., winner of the "Wembley" trophy, 1935.

Mr. F. W. Waterton—30 c.c. hydro. "Tubby," which has the distinction of being the boat with the greatest beam we have ever seen for a metre racer.

Mr. R. Hallam—Flash steam hydro., "Menai."

Mr. H. Ashcroft—"Mayfly II" with 30 c.c. 4-stroke engine to the design of Mr. D. Campbell (now running full-size craft in H.M's. Navy).

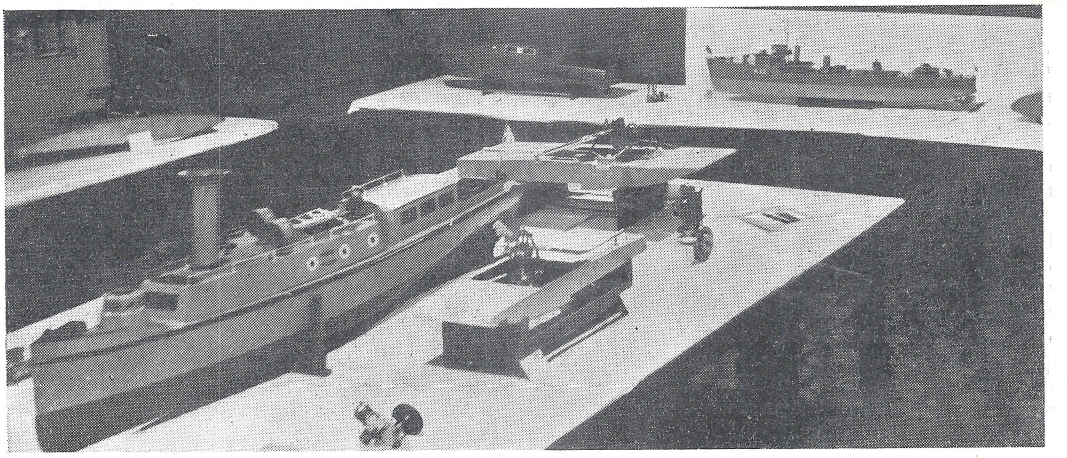
Mr. F. W. Westmoreland—"Two Freds," 30 c.c. hydro., and "Evil Spirit," by the late Mr. F. Westmoreland.

Mr. S. Cooper—15 c.c. 2-stroke hydro., "Meg."

Mr. A. Roberts—Unfinished petrol-engined hydro.

PROTOTYPE MODELS:

Mr. E. F. Fry—5 ft. 6 in. model of an Admiralty pinnace, with twin cylinder compound steam engine, Yarrow boiler, feed and bilge pumps, etc. This is a magnificent model, the largest of our craft, and holds the Club Steering Cup.



Some of the Models at the Altrincham Model Power Boat Club's Exhibition.

Mr. F. Atkinson—Metre flash steam cabin cruiser "Kleen III," a plank-built job finished beautifully in natural wood, varnished only.

Mr. J. W. Bodell—Petrol-driven cabin cruiser.

Mr. J. Brett—5 ft. open river launch, built up aluminium hull, two twin-cylinder "Sun" engines and flash steam boiler plant.

Mr. F. L. Davies—1/72 scale model of an

Admiralty "V" class war-time destroyer, with electrical plant. An almost completely detailed model, which is at present being converted to flash steam propulsion.

MISCELLANEOUS:

Mr. W. Tomkinson—30 c.c. 2-stroke engine.

Mr. F. W. Waterton—50 c.c. 4-stroke and 15 c.c. 2-stroke engines.

Messrs. G. and J. Barrow—Stuart "B.B." and castings for 30 c.c. petrol engine.

Mr. D. Innes—Flash steam hydroplane plant and hull, Babcock type water tube boiler, twin cylinder S.A. steam engine and patterns for 15 c.c. 4-stroke engine.

Mr. S. Cooper—Partly-finished 30 c.c. 4-stroke engine.

Mr. E. R. Fry—Dug-out hull for cargo steamer, Scott boiler, blowlamp and "Sun" engine for a destroyer.

Messrs. R. Hallam and A. Grant—Two sets of unfinished parts of experimental single cylinder S.A.P.V. engines.

Mr. H. Wraith—Piston for 30 c.c. 2-stroke engine.

Mr. F. Westmoreland—5 c.c. 2-stroke engine, built by the late Mr. F. Westmoreland.

Mr. H. Ashcroft—Hull of "Mayfly I."

Mr. O. B. Bates—Propeller gauge.

Mr. G. J. Scales—Experimental flash steam boiler with thermostatically controlled feed water supply.

Hon. Secretary, F. L. DAVIES, 5, Skelton Road, Stretford, Lancashire.

Model Hull Design and Testing.

THE discussion on the above subject, organised by the Model Power Boat Association, and held on January 30th, was well attended, and some very interesting and vital points were considered. Mr. L. J. French, who opened the discussion, described his own experiences with model racing hulls over a period of several years, and also a series of experiments which he had carried out with a view to establishing more or less exact data regarding the resistance and stability of model hydroplane hulls. There were many practical difficulties in the testing of hulls separately from power plant, and after trying various methods, he evolved a form of water trough, in which a stream of water was kept flowing at a constant and known rate by supplying it from a tank, continually fed with water, the pressure head to the trough being regulated by adjusting the height of the overflow from the tank. The model hull was moored in the trough to a form of beam scale, which registered the pull caused by the water flow, which, of course, represented the drag or resistance of the hull. With this device, the largest size of hull which could be tested was about 6 ins. long, and the data obtained was mainly comparative, but several useful conclusions had been arrived at regarding planing angles, areas and loading, and the effect of various transverse hull sections. It was observed that in most cases, stability was only obtained at the expense of increased drag, and that the cleanest running hull was not usually the one having the lowest drag.

Other speakers raised questions concerning the effects of various plane loadings and the possible advantages of false planes separate from the hull. Some valuable ideas on this subject were contributed by Mr. J. C. Hudson, who demonstrated some very interesting towing models with which he had carried out many experiments. These hulls involved very interesting principles in the combination of a single main plane, either integral or separate from the hull, and a small, totally submerged stabilising plane. Various methods of towing these hulls had been employed, the simplest being a rotating arm which reproduced the conditions of the circular course, the motive power being applied by means of a cord on a drum attached to the pivot head. By this means, scale speeds up to 50 m.p.h. were obtained. The towing line was attached as near to the centre of gravity as possible. Some controversy arose as to whether this was the correct place to apply the propelling force so as to reproduce the conditions of power drive. Other questions respecting the essential difference between free running and captive boats, as represented by straight and circular course running, and the effect of torque reaction and centrifugal force on the balance and stability of hulls, were discussed. At the close of proceedings, it was felt that while no very definite or new facts had emerged from the discussion, there was every reason to believe that the exchange of ideas and opinions could not fail to have its effect on the progress of hull design.

Business Enquiries and Replies.

Barometer and Thermometer.

Q.—Could you tell me where I could purchase a secondhand recording barometer and also recording thermometer?

A.—Broadhurst Clarkson & Co., 65, Farringdon Road, London, E.C.1.

(Holloway, 878.)

Knitting Machines.

Q.—I should be pleased if, through THE MODEL ENGINEER, it is possible for you to inform me of any firms or dealers able to supply secondhand knitting machines and parts of same.

A.—Harrison Patent Knitting Machine Co. Ltd., 54, Goodge Street, London, W.1; Lester Barnes & Co., 168a, Marlborough Road, Holloway, London, N.19; Maratti High Speed Circular Knitting Machines Ltd., 716, Salisbury House, London, E.C.2.

(Arbroath, Angus, 881.)

QUERIES and REPLIES

Querists must comply with the Conditions and Rules given with the Query Coupon in the Advertisement Page of each issue.

6,679. — Testing Inventions. — T.R.B. (Bangor).

Q.—Having invented a new type of motor car silencer, I would like to have it tested for silence and back pressure. Could you please recommend where I could have it done?

A.—You could have your motor engine silencer tested at the National Physical Laboratory, Teddington, Middlesex. This Institution, for a fee, would undertake the test and ascertain the information you desire to have, and would give you an official Report. Write to the Director for particulars and scale of charges. This is the recognised Research Institution for the country.

6,910.—Position of Displacement Lubricator on Model Loco.—R.M.E.(Upper Clapton).

Q.—Can you tell me if a displacement lubricator can be placed at some distance from the cylinders in a 2½″ gauge loco with success? The pipe being exterior to boiler and lagged if necessary?

A.—The main points to watch are that it should be situated so that the oil pipes fall the whole way to the cylinder, while the lubricator itself should be as cool as possible. For these reasons, the fixing of a lubricator so that it is out of sight is often a matter of some difficulty. We would not recommend mounting it in the cab unless the cab is large and airy, or the lubricator is fixed as far away as possible from the firebox backplate.

6,888. — Air Compressor for Pumping Tyres.—F.H.S. (Petts Wood).

Q.—I have just removed an air compressor and 1/6 h.p. motor from a domestic refrigerator. I thought this compressor would pump up my motor tyres, but I find it cannot even lift my finger off the nozzle. The bore is ⅞ in. and the stroke the same, but there is no packing or rings on the piston, and just relies upon the film of thin oil to form a compression. It runs at about 550 r.p.m.

Is it possible to adapt such a small pump for the purpose required, and shall I be more successful if I fit a piston with some form of packing?

A.—It would not be possible to give you any very definite advice regarding your air compressor, without more details of its design and construction. It is possible that the refrigerator in which it was incorporated was designed to work at a very low pressure, in which case, the clearance volume in the cylinder of the compressor might be too large to enable a high pressure to be raised. The piston seal in refrigerating compressors generally needs to be fairly efficient, so we should not expect this to be the cause of the deficiency, unless the cylinder and piston are very badly worn or scored. The size of the compressor is, however, very small for using as a tyre inflator, though this would only affect the time taken to fully inflate the tyre, and would make no difference to the working pressure.

6,926.—Staining Ivory Balls. — J.E.M. (Holloway).

Q.—I am trying to find a medium for staining or painting some ivory balls (billiard balls). Could you tell me what to use?

A.—To stain ivory or bone red, steep in good red writing ink; this stain is not, however, waterproof, and will not stand much washing.

The following can be fixed against water by being applied on a fixer. Aqua fortis 2 oz., salammoniac ¼ oz. mixed. Then add powdered tin ¼ oz., water 1 oz. When all dissolved, steep the ivory or bone in it and allow to dry. Afterwards, steep in Brazil wood ½ lb., water 1 gallon, boiled together. Steep ivory or bone at boiling heat.

If scarlet colour is wanted, use lac dye instead of brazil wood.

6,934.—Size of Transformer Core.—J.W.M. (Hull).

Q.—According to the formula given on p.18 of your handbook, "Small Transformers," the weight of core required for a transformer giving an output of 400V—A on a 50 cycle circuit would appear to be 24 lbs. But in a reply to query No. 6,673, in your August 15th issue of 1935, I notice a core is recommended for a similar output which weighs only 9.2 lbs. Will you please explain the discrepancy?

A.—A considerable latitude is possible in applying the "constant" K in the above formula which is quite a good average value for a general purpose transformer. The design recommended in query 6,673 relates to one required for the specific purpose of stepping down the mains voltage suitably for an open type arc lamp, and in such cases it is customary to employ a smaller section of iron, and more copper, Voltage regulation is not of primary importance with an arc lamp, in fact it is better to provide for what would be considered an excessive volt-drop in other cases, in order that when the lamp carbons shortcircuit the secondary, voltage automatically falls and tends to check any dangerously large current. All "output coefficients" need applying with discretion, according to the dictates of experience, no matter what apparatus is concerned. It is, for instance, possible to vary the proportions in weight between iron core and copper windings of a transformer to a large degree without altering the voltage ratio, but the performances on load will be noticeably different. A point also to be taken into account and which frequently modifies the decision as to size of iron core is the ability to obtain what is wanted from the makers' nearest stock size of tools; the cost of building up a core which required special sized tools for its production would often be prohibitive.

PRACTICAL LETTERS from OUR READERS

Speed Boat Records.

DEAR SIR,—There have appeared a claim and several comments regarding a speed boat record made in Australia, and I notice that in your remarks in the February 6th issue, that you mention its acceptance by M. Suzor.

It appears that in claiming to beat "Chatterbox," a matter secondary in importance only to the actual speed, the distance covered has been entirely overlooked. I am quite sure that you will appreciate the importance of this.

The facts appear to be that the 300 yards record by "Chatterbox" still stands. This is the world's record as far as English model power boating is concerned, since we accept no lesser distance. Before anything around the 200 yard mark can be considered the "best ever" performance, irrespective of official acceptance, a figure getting up to nearer the fifty mark must be obtained.

I take this opportunity of offering my congratulations to Mr. Cowen on a very good performance, and at the same time to urge him to attempt the bigger distance.

Yours truly,

Bow. S. L. INNOCENT.

Flash Boilers.

DEAR SIR,—I was interested in Mr. L. Ashworth's reference in the January 30th issue, to the Sulzer Mono-tube Boiler, which, it may be remembered, was illustrated in my article on the design of Flash Boilers in the issue of the "M.E." dated May 23rd, 1935. The inference suggested by the words quoted by Mr. Ashworth is that model flash boilers ought to have a tube length in proportion to diameter comparable to that found to work efficiently in this boiler, that is, 30,000 to 1. I do not think that this is correct, however, for the following reasons :—

(1) The ratio of surface to volume does not remain constant as the size of tube is decreased. Not counting the wall thickness, $\frac{1}{4}$ in. tubing of a given length would have one-sixteenth of the same volume as the 1 in. tube, but one-fourth the superficial area. Thus its heating efficiency per unit volume is four times as great—more than this when tube thickness is concerned.

(2) In a tube of large diameter, one of the difficulties connected with heat transmission is that the fluid in the centre is to some extent insulated from the tube wall and cannot be heated as efficiently as that in contact with the wall. Thus heat transmission favours the small tube.

(3) In the particular boiler referred to, its thermal efficiency had to be more or less comparable with that of other forms of large boilers already known to have very high efficiency, otherwise it would have no commercial significance. In model boilers thermal efficiency is not the most important issue ; the discharge rate of the boiler is far more important and has a great deal to do with the power-weight ratio. A more economical boiler, if its bulk and weight were much greater than the type generally used, would be at a disadvantage.

(4) Skin friction is bound to be considerable in a boiler tube of small diameter, and therefore, undue length must be avoided or the discharge rate will again be adversely affected.

Lengths and diameters of generating tubes have always loomed largely in the problems of boiler design, irrespective of type, and I believe I am correct in saying that rules which have been proved to be applicable for one size of boiler are notoriously unreliable for other sizes. This is another thing which won't scale down.

Yours faithfully,

London, S.W.9. EDGAR T. WESTBURY.

The Future of Model Petrol Planes.

DEAR SIR,—After reading Mr. F. A. Lowe, on the future of petrol planes and their attendant dangers, I feel that as my cross-country flight called forth this and other literary efforts, it's now up to me to give an opinion.

On the whole his suggestions are quite acceptable, but he seems to have missed a highly important point, i.e., compulsory third party insurance for all who fly mechanically powered models. Here, in the Leicester Club, insurance is effected to cover *all* members up to £2,500 risk, and very cheaply too ; the ease of mind alone is worth every penny. In addition, there is a rule which prevents a time switch being set for longer than a one-minute engine run, and such switches must be fitted to all machines.

I see no good reason why, if something like this is carried out, there should be any more risk in petrol model flying than in compressed air, rubber, or even speed boating, where I tremble to think what would happen if a line came adrift at speed and the pond side was full of spectators.

All the modellists with petrol-driven planes may rest assured that if they take out insurance cover and select a flying ground away from the crowds and over three miles from any licensed aerodrome, there will be no shouts from those in authority, and we can go our way unmolested.

Yours faithfully,

Leicester. A. E. BROOKS.

Brighton Coal Allowances.

DEAR SIR,—In the interests of accuracy, would you kindly allow me to make a correction of what is probably a printer's error in my letter published in the February 20th issue.

The last paragraph but one should, of course, read "$1\frac{1}{4}$ lbs. for each coach" and not as printed.

Yours faithfully,

London, N.12. A. G. WILLIAMSON.

Institutions and Societies.

The Society of Model and Experimental Engineers.

Meetings. At Caxton Hall, Westminster, at 7.0 p.m.

Monday, March 23rd. Lecture. Subject to be announced later.

Dinner. The annual dinner will be held on Saturday, April 4th, at the Criterion Restaurant, Piccadilly Circus. Tickets, price 7s. 6d. each, may be obtained from the Secretary or any member of the Council.

Workshop. Monday, April 6th, Rummage Sale.

Secretary, R. W. WRIGHT, 202, Lavender Hill, Enfield, Middlesex.

Leicester Society of Model Engineers.

The next meeting will be held on Friday, March 6th, at 8.0 p.m. at St. Mary's Schools, Castle Street.

On Saturday, March 7th, there will be a visit to the Nottingham Model Engineering Society's Exhibition.

Hon. Secretary, J. WALKER, 78, Waltham Avenue, Braunstone Estate, Leicester.

Southampton and District Model Engineering Society.

There will be a meeting of the Society on Wednesday, March 11th, 7.30 p.m. at headquarters, Adyar Hall, Carlton Crescent. A two-part programme is arranged, having first a "Dutch Auction" of models, parts thereof, tools, materials, surplus of any kind, "junk" not excluded, so now is the opportunity to have that long promised "spring clean."

Secondly, two supposed mugs who desire to start model engineering wish to buy a lathe; what points should they look for and why? These should produce some fun and, at the same time, afford some excellent discussion.

Hon. Secretary, H. LAINSON, 8, High Street, Eastleigh.

Norwich and District Society of Model Engineers.

On February 17th, through the courtesy of Mr. A. L. Higham, Engineer and Manager, members were conducted through the works of the British Gas Light Co., at the St. Martins and Bishop Bridge Works. Considering the very inclement weather, a large party assembled to take advantage of the occasion, 35 members being present. Two guides had been provided, and the members were shown all the processes that are necessary in the making of gas. Starting at the coal wharf, where the coal is unloaded, passing through all the buildings containing the machinery, from thence to Bishop Bridge, where the gas is finally metered, and stored in the gasholders, the party were entertained and interested by everything they saw. The warm thanks of the Society are tendered to Mr. Higham, who arranged the tour, and to the members of the staff who so kindly co-operated as guides to make the visit so interesting. Mr. Scott, the Works Chemist, has kindy consented to give a talk on the making of gas, illustrated by lantern slides, at the next meeting of the Society on March 5th, at the headquarters in King Street, Norwich.

Hon. Secretary, W. F. A. WAY, 73, Gipsy Lane, Norwich.

The Manchester Model Railway Society.

At a meeting on Tuesday, January 28th, the retiring President, Mr. G. M. Rickards, presented, on behalf of the members, a handsome wireless set to Mr. E. Antwis, in recognition of his services to the Society as Treasurer and Exhibition Manager. The wireless set bore a suitable inscription. Mr. Rickards, in making the presentation, said that he sincerely hoped that the set would give many hours of pleasure and recall many happy reminiscences. Mr. Antwis replied and thanked the members sincerely for their gift.

The Society attains on March 16th, 1936, yet another birthday, its 11th year of success. In connection with this, following last year's successful venture, both meetings for the month are social events. The first meeting is on Thursday, the 12th, at 7.30 p.m. A hot-pot supper is to be held, followed by light entertainment. The second meeting, on Tuesday, the 24th, at 7.15 p.m., is an open night, on which an official of the L.M.S. Railway, Mr. G. A. Warburton, will show and describe two L.M.S. 16 mm. films, "No. 6207—A Study in Steel," and "Permanent Way." A special invitation to readers of the MODEL ENGINEER is cordially extended.

Both events are being held in the Society's usual meeting room at The Briton's Protection Hotel, 50, Great Bridgewater Street, Manchester.

Hon. Secretary, ARTHUR PEAKE, 8, Methuen Street, Longsight, Manchester, 12.

Altrincham Model Power Boat Club.

The next evening meeting will be held at 8.0 p.m. on March 16th, in the Altrincham Library. All members are requested to attend.

Hon. Secretary, F. L. DAVIES, 5, Skelton Road, Stretford, Lancashire.

The Aylesbury Gang.

The above will meet at the First and Last Hotel, Dunstable, on Friday, March 6th, at 7.30 p.m. This will be an open evening.

H. D. BOND, Park Square, Luton, Beds.

The "Loco Brotherhood" (Essex Division).

Mr. J. N. Maskelyne, A.I.Loco.E., has very kindly consented to attend our monthly meeting, and give a talk, on Saturday, March 7th, at the Y.M.C.A., Victoria Road, Chelmsford, from 3 to 6 p.m.

All members should endeavour to attend this meeting.

Hon. Secretary, J. J. CLARKE, Hatfield Peverel, Chelmsford.

Nottingham Society of Model and Experimental Engineers.

The exhibition this year will be held on March 5th, 6th and 7th, 1936, in the exhibition hall at Victoria Baths (4 minutes' walk from the Palais-de-Danse), which is twice the size of the old hall, and many of the exhibits by the members, also exhibits from the Pinxton Model Society, Norwich Society, Leicester, Attenboro Model Aero Society and the local branch of the Skybirds League will be shown for the first time; the passenger carrying track will be extended to 100 ft. and there will be a free ciné show of model and real railway films.

Among the members' entries are some models of outstanding interest: Mr. H. Day's 2½ in. gauge 2-8-2 "Mikado" type loco. built from the outline drawing published in the "Model Railway News," April, 1926, this is contrasted by Mr. H. Wilshaw's 2½ in. gauge model of Stephenson's "Rocket." Mr. C. D. Bates' 4-4-0 "L.B.S.C." "Annie Boddie" is in running order, and on its first run hauled four adults. In the ship section Mr. Neville shows a wonderful model of the "Caliph," Mr. Litchfield shows some finely made water-line models of well-known ships and also a model dockyard.

The Society's reconstructed "O" gauge railway will be working, and many models will be running on compressed air, including some of the models from Norwich, which are a loan exhibit arranged by Mr. H. O. Clark, president of the Norwich Society. The models entered for the Open Challenge Competition will show a high standard of workmanship, and one interesting model is an electric goods lift operated by push buttons.

The trade will be represented by Messrs. Pools Tool Co., who will have the same stand as at the 1935 "M.E." Exhibition, including the demonstration of their lathes, drilling machines, etc., Messrs. Beecroft will have a working "OO" hump marshalling yard and demonstrating "Merco" and Stewart-Reidpath wagons, etc., and a selection of Messrs. Mills Bros. locos., rolling stock, buildings, etc., also a selection of locos., rolling stock, track parts, etc., made by Messrs. Bassett-Lowke, Ltd. Messrs. Photo Supplies, Ltd., will be showing various types of ciné projectors, cameras, etc., and a Bassett-Lowke goods; this firm is also supplying and operating the projector for the free cinema. Messrs. G. Kennion will have a stand for "L.B.S.C." castings and parts for various scale locos., also small tools, etc. Mr. G. Kennion will show his films of the railway centenary, etc., and will have his own projector.

The Society is indebted to Mr. C. W. Meredith for the loan of the film of the Craigard Railway, to the L.M.S. Rly. Co., for the loan of several of their films, included in these films is one showing the building of the "Princess Royal" locomotive. Mr. J. C. Crebbin is sending his loco. "James Milne" for work on the passenger track, and will conduct the official opening ceremony on Thursday, March 5th, at 7.0 p.m., supported by Mr. J. N. Maskelyne and other well-known gentlemen in the model engineering world.

Visiting members of other societies to our exhibition are asked to make themselves known to the Secretary or any of the stewards in attendance and to sign our visitors' book.

Hon. Secretary, J. E. BRAILSFORD, 4, Whitehead Street, Nottingham.

Croydon Society of Model Engineers.

Our next meeting, a "Demonstration Night," will be held on March 9th, at 8 p.m., at Clyde Hall, Clyde Road, Addiscombe.

Hon. Sec., H. W. CLEMENTS, "Olivedene," Coulsdon Road, Old Coulsdon.

The Hastings Model Yacht Club.

A power boat section of this Club is now formed, the Section Secretary being Mr. T. Bridgland, of 31, St. George's Road, Hastings.

A movement is on foot sponsored by the President, Admiral Dannreuther, to obtain a special lake, to be known as the King George V Memorial.

Hon. Secretary, W. J. BALCOMBE, 57, St. Mary's Road, Hastings.

The Manchester Society of Model and Experimental Engineers.

The next meeting of the above Society will be on Friday, March 6th, 1936, at the Manchester Schools of Technology, Sackville Street, Manchester, at 8 o'clock. Open night.

Hon. Secretary, W. E. WOOD, 20, Albert Place, Longsight, Manchester, 13.

Notices.

The Editor invites correspondence and original contributions on all small power engineering and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. Unless remuneration is specially asked for, it will be assumed that the contribution is offered in the general interest. All MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall and Co., Ltd., 13-16, Fisher Street, London, W.C.1. Annual Subscription, £1 1s. 8d., post free, to all parts of the world. Half-yearly bound volumes, 11s. 9d. post free.

All correspondence relating to Advertisements and deposits to be addressed to THE ADVERTISEMENT MANAGER, "The Model Engineer," 13-16, Fisher Street, W.C.1.

Contents.

The asterisk (*) denotes that the subject is illustrated.

SALES AND WANTS

EVERYBODY'S MARKET

ENGINEERING & SCIENTIFIC ELECTRICAL GOODS

Advertisements are inserted in these columns at the rate of **One Penny** *per word; minimum charge for advertisement,* **One Shilling.** *Single letters or figures are charged as words, and a compound word as two words. The advertiser's name and address are charged for.*

Advertisers who wish to separate *their announcements into distinct paragraphs must have not less than 20 words in any one paragraph followed by the word "Below"—which is charged for.*

"Box" replies, *care of these offices, are charged 6d. extra to cover postages. The following words must appear at end of advertisement: "Box——, 'Model Engineer' Offices," for which usual rate will be charged. (Advertisers need not include our full address.)* **When replying to a "Box No." advt.** *address your envelope: Advertiser, Box——, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

All advertisements in these columns must be prepaid, *and remittances should be made by Postal Orders or Stamps, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1.*

Please state under which Classified Heading you wish your advertisement to appear; the classifications are as follows:—

General, Models, Wireless, Motoring, Tools, Engines, Electrical, Business, Wanted.

Advertisers are requested to send in their announcements as early in the week as possible, as although we accept advertisements up till the first post on Friday preceding the date of issue, **we cannot guarantee the insertion of those arriving on this day.** *Telephone: Holb.: 3818-3819.*

OUR DEPOSIT SYSTEM.

We will receive from intending purchasers the purchase money of any article advertised or sold by our advertisers, and will acknowledge its receipt to both the Depositor and the Vendor, whose full names and addresses must be given. Unless otherwise arranged beforehand between the parties, it is understood that all goods are sent on approval, and that each person pays carriage one way if the goods are returned. The deposit is retained by us until we are advised of the completion of the purchase, or of the articles having been returned and accepted. In addition to the amount of the deposit, a fee of 1/- for the sum of £1 and under, and 1/6 for amounts in excess of £1, to cover postage, etc., must be remitted at the same time, and sent to the Advertisement Manager, "The Model Engineer," 13-16, Fisher Street, London, W.C.1. In cases of persons not resident within the United Kingdom, double fees are charged.

The amount of the deposit must be sent either by Postal Order or Registered Letter. **(Cheques cannot be accepted.)**

The fee mentioned above should be sent in stamps or by Postal Order as a separate amount.

In cases of exchange, money to the value of the article should be deposited by each party. **We cannot receive the articles themselves.**

General

Watch and Clock Repairs. Guaranteed trade prices.—BLAKISTON & CO., Ainsdale, Lancs. Importers of Watches, Clocks, Movements, Materials and Tools. All parcels fully insured. Complete list, 3d.

Cheap Printing. 1,000 Billheads, 3s. 6d. Samples free.—CRETEWAY PRESS (22), Buxted, Sussex.

Small Turned Screws, Nuts and Washers. Assorted gross B.A., brass 2s., steel 2s. 6d. Whitworth, brass, 3s., steel, 2s. 6d. List and samples, 2d. Trade supplied.—J. H. BENNETT, Station Road, Willesden Junction, N.W.10.

Reduced Prices: Eureka Improved Air Compressors. Castings and Drawings from 9s. per set. Photo 3d.—POYSER, Peck's Hill, Mansfield.

Air Compressors, New patent, 25s.; Super Spray Guns, 17s. 6d. Complete plants.—JOHN M. E. STEEL, Bingley.

"Ajax" Safes Might Save Ruin from fire or theft any time. List, application.—GREENWOOD, Arnside Road, Southport.

"Machine Shop Companion." Splendid book, 100 illustrations, post free 2s. 3d. (abroad 2s. 6d.).—BENTLEY'S PUBLISHING COMPANY (Dept. M.E.), Halifax, Yorks.

Ball Bearing Plummer Blocks, 1", 5s.; ½", 4s. 3d.; Gun Metal less 50 per cent., Shafting, Hangers, Pulleys, Cones, complete Countershafts from 10s.—Below.

Ball Journals, ¼", 9d.; ⅜", 1s.; ½", 1s. 2d.; ⅝", 1s. 4d.—HALL. 30, Collindale Avenue, Erith.

"M.E." Vols. I, II and III, in original bindings. Perfectly new, as received from binders; also Vol. I in reading case with strings, in 12 separate issues. What offers? —DANSON, 54, Gassiott Road, Tooting, London, S.W.17.

No Insurance for burnt books, deeds, etc.! "Ajax" Safes protect them.—GREENWOOD, Arnside Road, Southport.

6 Cub. Ft. Air Compressor. Drawings and all material, 50s. delivered; photo 6d.—49, Dale Street, Milnrow.

"Maxspray," new rapid electric paint spray plants, universal current, £7 complete. Agents wanted.—JOHN M. E. STEEL, Bingley.

METALS. Small Quantities Supplied.—M. ROSE, 54, Ravenor Park Road, Greenford, Middlesex.

450 "Model Engineers," 1921-1927, £1; carriage paid.—MORRIS, Engineer, Countesthorpe, Leicester.

For Disposal, 10 years of back numbers of "The Engineer," what offers? — Box 975, MODEL ENGINEER Offices.

Steel Tubing, Cold Drawn, 3/16" to 4¼", 1/32" to ½" thick, for flash boilers, etc. Please say the lengths you cut to.—F. C. COTES, 28, Church Walk, Brentford, Middlesex.

Drummond 3½" Lathe, round belt, stand, treadle, 2 Cushman chucks, accessories, £10; 2 h.p. Horizontal W.C. Petrol Engine, with carburettor, 30s.; 15 Volt 10 Amp. Shunt Wound Dynamo, 30s.; 15 Volt 10 Amp. Ditto, 15s. All above perfect. Offers.—FORSYTH, 4, Foord Road, Folkestone.

Pulleys, Shafting, Hangers, Assorted Gauges, Lathe Tools, offers; Drill Chuck, 7s. 6d.; Girder Frame, carrying shafting.—579, Bristol Road, Bournbrook, Birmingham

"M.E." Hexagon Head Screws, "Landite" Silver Solder, Brass Rods. Sample either lot, 1s.—30, Highfield Road, Doncaster.

Bright Mild Steel Rod in 3' lengths, 2 each 3/16" and ¼", 1 each 5/16", ⅜" and ½" dia., 21' for 2s. 6d.; Ditto, 2 each 3/16", ¼" and 5/16" dia., 18' for 1s. 6d.—Below.

Silver Steel, 1 doz. 13" lengths, 1/16"-½" dia., 2s. All above post free. — PARKER'S, 84, Northgate, Wakefield.

A Little Tommy Hummer. 30 c.c. Stuart Single 4-str. A gift, £4 10s.—81, Griffin Road, Plumstead.

Exceptional Offers. ½" bore Hand Feed Pumps, loco., or stationary, new, 5s. 6d. each; 15 c.c. Aero Engines, plug, carb., contact, propeller, £2 10s., new, wt. 16 ozs.; Ditto, Marine, with flywheel.—Below.

½ h.p. Stationary "Supreme" Plant, magneto, etc., complete for workshop, as new, £4, cost £22; H.M.V. Table Gramophone and Records, as new, 30s.; 25 feet of Passenger-carrying Track, double, takes 2½" and 5" gauge, 25s.; Electric Toolpost Grinders, listed £8, price 36s. new.—Below

"Ford" Coils, sound, 2s. 6d.; 110 Volt Vacuum Cleaner, perfect, £1. All post free. Appointment only. Send stamped envelope.—M., 80, Ridgeview Road, N.20.

"Modern Engineering Workshop Practice." By H. Thompson, A.M.I.Mech.E. A textbook for the use of engineering students, apprentices and engineers. 328 pages; 400 illustrations, 7s. 6d.; post free 8s.—PERCIVAL MARSHALL & CO. LTD., 13-16, Fisher Street, London, W.C.1.

Be Popular. Play the Piano Accordion. Easily learnt in a few weeks. Write for free illustrated list of "Pietro" Piano Accordions, as used in leading dance bands. Prices from £3 3s.—E. H. GILES, 310, Markhouse Road, London, E.17.

"Home Toymaking," just published, with 180 illustrations, 1s. 2d.—Below.

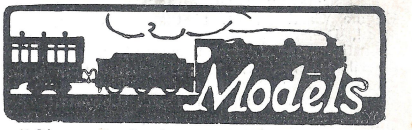
"Die-casting in Lead." A handbook on making lead toys, with catalogue of dies, 1s. 2d. — INDUSTRIES, 13, Gordon Avenue, Twickenham.

"Machine Shop Companion." By Wallace Bentley, M.I.Mech.E. Contains practical notes, rules and tables for every-day workshop use, and a chapter on screw cutting; most useful reference book for engineers. 131 pages; 86 illustrations. 2s.; post free 2s. 2d. —PERCIVAL MARSHALL & CO., LTD., 13-16, Fisher Street, London, W.C.1.

Home Cinematography

Electric Home Cinemas, standard films, cheap. Lists.—WAYLAND, 109, Kenlor, Tooting, London.

For Sale, Ciné-Kodak "Eight," carrying case, Kodascope "Eight" Projector and collapsing screen, cost £24, taken only 300 ft. of film, new condition, £15; or exchange Passenger-hauling Coal-fired Loco., Watchmaker's or Precision Lathe, Senior Type Small Milling Machine.—Box 976, MODEL ENGINEER Offices.



"Pioneer" Castings and Parts, machined or rough. Stamped envelope for list.—FENN, 2a, Charles Place, Drummond Street, London, N.W.1.

Boilers in Steel or Copper, all types and sizes. Locomotive Boilers from ½" scale made to fit your frames, flanged plates, supplied copper or steel.—GOODHAND, Marlborough Road, Gillingham, Kent.

"OO" Gauge Brass Track, Points, Correct Section Rail, any radius, free samples, rail or sleepers separately. Send your enquiries to.—T. & M. PRODUCTS, 1, West Street, Leigh-on-Sea, Essex.

Model Locomotives of the High-pressure Internally-fired Type, for the discriminating model engineer. Now ready—List (a) Locomotives from "O" to 1" scale; List (b) Blue-prints; List (c) Rolling Stock, Track and Track Parts, 3d. each, post free.—"EJAYCEE" MODELS, E. J. COOKE, 66a, George Street, Hastings.

¾" Scale 4-6-0, Coal-fired, super-detail, perfect workmanship, powerful. Stamp.—Box 974, MODEL ENGINEER Offices.

Model Tug Boat, 4' 6", copper hull, oil fuel, superheated steam, cost £75, carriage case, high class finish, £10. Photo.—REED, Wyngarth, Cleadon, Sunderland, Durham.

Authentic Blueprints of "L.B.S.C.'s" Engines. Now ready. "Maisie." "Hollywood Annie" 2½" gauge American 4-4-0 (modern type) with booster tender. "Lucy Anna" American 4-8-4 "O" gauge Passenger Hauler. "Tess" 9½" gauge 0-4-0 Saddle Tank.—BEWAN SPRINGER, 12, Glazebury Road, W.14.

"Model Engineering." By Henry Greenly, A.I.L.E. With working drawings of Engines, Boilers, Rolling Stock, Cannon, Electric Machines, etc., 85 photographs and 724 line drawings. Price 9s. 3d., post free.—PERCIVAL MARSHALL & Co. LTD., 13-16, Fisher Street, London, W.C.1.

Vertical Copper Boiler, 12" × 6", with engine, 1¼" × 1½". 30s.—BRICE, West End, Witney.

Sale, Steam Generator, V4A1, pressure gauge, etc., good condition, quick sale, £4 10s. or near offer. Particulars.—H. FRODSHAM, "The Beeches," Moore, Cheshire.

Whoa! You Want These. Same Railway Track as "L.B.S.C." uses, 3d. foot; special price for over 300 feet. Handrail knobs, 2½" gauge, 2s. doz.; larger, 2s. 6d. doz.; Rods for knobs, 2d. and 3d. per 3' lengths; all nickel silver. Postage extra. Everything in stock for "Dyak," "Maisie" and all "L.B.S.C." engines. Stamp for enquiries please.—SUMMERSCALES, Soham, Ely, Cambs.

"O" Gauge "Royal Scot" Loco., also L.M.S. 0-6-0, electric driven, also about 60' rustless steel track. Locos. by Bassett-Lowke. £4 the lot.—SMITH, 55, Colne Road, Burnley, Lancs.

Powerful Traction Engine, 1¼" scale, single cylinder blueprints, 7s. 6d. set; compound, 9s.; or 1s. 7d. each. Castings, Materials, Finished Parts and Fittings, list 1½d.—Below.

Model Boiler Fittings, reduced prices, also Horizontal Mill Engine, see advert., Feb. 6th. —Below.

"Dyak" Gauge 1 Wheel Castings, Etc. Pressure Gauges, ¾" dial, 100 lbs, 6s. 9d. List stamp.—A. J. EVERY, Engineer, Mill Lane, Shoreham-by-Sea.

Gauge "O" G.W.R. "Saint" 4-6-0 Express Engine, clockwork. G.W.R. 2-6-2 Tank, clockwork, 22s. 6d. each. Postage 1s. —STRETTON-WARD, 11, Radford Road, Leamington Spa.

Model Steam Tubular Steel Boiler, fittings, engine, 1 × 2, pump, dynamo on baseboard, gas ring 30s. Another, Engine, 12s. 6d. Photo stamp.—MORRIS, Engineer, Countesthorpe, Leicester.

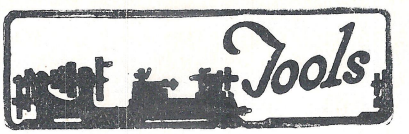
Steam Engine, horizontal, 1¾" bore, with coal-fired boiler, gauges, water pumps and all fittings, complete offers, would accept smaller engine and boiler part exhange. Wanted ½ h.p. 230 V Induction Motor.—WEDGE, 218, Rockingham Road, Kettering, Northants.

4-6-4 Tank Loco., 3½" gauge, boiler riveted and silver soldered, working pressure 80 lb., perfect working order, £15.—CARTMELL, 15, Castle Street, Shrewsbury.

1" Scale "Model Engineer" Traction Engine Castings. List stamp.—30, Highfield Road, Doncaster.

Castings for Launch-type Engine, as being described in "M.E." Bedplate, gunmetal, 2s. 6d.; iron, 2s. post free. List stamp.—East Garage, Whapload Road, Lowestoft.

"Model Steam Locomotives." Their Details and Construction. By Henry Greenly, A.I.L.E. With 376 photographs, diagrams and working drawings. Choice of Scale and Gauge—Locomotive Types—The Principles of Model Locomotive Designs—Boiler Design—Construction Details: Frames—Axle-boxes and Springs—Wheels, Axles Crank Axles and Crank-pins—Bogies, Pony Trucks and Radial Axle-boxes—Cylinders—Valve Gearing: Motion Details—Boiler Construction—Boiler Mountings and Cab and other Fittings—Tenders and Drawgear—Firing and Boiler-feeding Devices. Price 6s. 6d., post free.—PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street, London, W.C.1.



Buck and Ryan's Lathe Department. Drummonds, Milnes, Myford, Exe, Union, Portass, Edgar, Bantam, Boley-Lienen, I.XL. 5" Leader, Master, and many other well-known makers. Send your enquiries to our special Lathe Department M.—310-312, Euston Road, London.

Ideal Lathes, 3" Centres S.C.B.G., Comp. Rests, quick return to saddle. 3½" Lathes, S.C.B.G., Comp. Rests. Lists. Stamp please. —WILLIMOTT AND SON, Nevilles Factory, Chilwell, Notts.

Milling Attachments, Dividing Heads, Circular Table. — WHEELER CO., LTD., Trench, Wellington, Shropshire.

Reduced Prices: Eureka H.S.S. Ball Bearing Drilling Machine, Filing Machines, Rotary Tables. etc. Drilling Machine Drawings and Castings from 10s. 6d. per set. Photos 3d. each.—POYSER, Peck's Hill, Mansfield.

Lathes, Power and Treadle, by all the leading makers in stock. Send your inquiries.—ROSS & ALEXANDER (LONDON), LTD., 165, Bishopsgate, E.C.2.

Lathe Buyers, Look. Several incomplete lathes for disposal, cheap. 3½" Plain, to 6" centres, s/cutting. For all purposes, treadle or power. From 50s. upwards. Stamp reply. —FORD, 174, Vicarage Road, Leyton, E.10.

Micrometers, New, 1/1000", 0" to 1", ratchet and lock nuts, decimal equivalents stamped on frame in case (foreign), 17s. 6d. each; guaranteed.—MURRAY, 30, Gt. Charlotte Street, Liverpool.

Disposal, Contents Engineer's Workshop. Drummond S.S.S. 6" Heavy Lathe, 3 chucks, tools, countershaft, perfect, £50; Toolpost Grinder, Aloxite wheel and overhead tackle, 30s.; Heavy Vertical Slide, £1; Castings for another, 4s. 6d.; Horizontal Milling, gear-cutting attachment, worm dividing head, £3. Photo stamp.—Below.

Toolpost Milling Spindle, double geared, 3" to 6", lathe, £1; Another, incomplete, 5s.; Pair H.S. Side and Face Cutters, 2¼" × 11/16" × 1" hole, 7s. 6d.; Slotting Cutter, H.S., 3" × ½" × 1", 3s. 6d.; Keyway Cutter, 1¼" × 7/32" × ⅜", 2s.; H.S. Side End Mill, 1½" × 1¼" Morse 2 Shank, 5s.; Face Cutter, 1¼" × ⅝" × ½", 2s.; Gear Cutters, 1⅜" × ⅜", 16 & 20 P., 5s.; 6 New Centre Drills, 2s.; End Mills, 3/16" P., ¼", ⅜", 1 Morse, 5s.; Morse Sleeve, 2 to 1, 1s.; 9 Taper Shank Drills, H.S., 17/32" to 1", 25s.; 10 Parallel Reamers, ⅛" to 1", £1; 6 Slotting Saws, 2½" × ⅝" hole, 3s.; Large Angle Plate, 5s.; Sensitive Power Drill, slotted adjustable table, rise, fall to floor on turned column, keychuck ½", £4 10s.; Millers Falls Bench Hand Drill, £1; Atholl Micrometer, 1", new, £1; Starrett Combination Square and Protractor, 12", new, £1; Various Steel Rules, Callipers, Dividers, Slide and Surface Gauges, Bevel, Squares, £1; 2 Screw Packing Jacks 3s. 6d.; Double-ended Grinder, Overhead Drive, 8 Grinding Wheels, 5 Polishing Buffs, 50s.; Pair 2" × 1" Hardened Steel Vee Blocks, new, 5s.; Pair each 5" × 1½" × 3 and 2 × 1 × 1 Vee Castings and Patterns, 5s.; Set Castings and Patterns 'M.E." Machine Vice, 10s.; 6" Heavy Backplate Casting, 2s.; 3 Sp. Pulley Casting, 7", 5", 3", 2s.; Wood Pulley, 16" × 6" Dodge, 5s.; 6 Iron Pulleys, 6s.; Large Field Magnet Casting, wound armature, copper commutator casting, 5s. lot; Five 30 V 30 W Gas-filled Bulbs, 2s. 6d.; 2" Switchboard Ammeter to 10, 2s. 6d.; 3½" Switchboard Voltmeter to 160, 5s.; Lucas 12 V Car Dynamo, switchboard and split aluminium pulley, £1; Bosch 4 Cyl. Mag., no points, 4s.; Large Carbide Generator, 2s.; New Square Generator, snip, 5s.; New Car Ammeter, 20, 2s. 6d.; Set 2 Stocks, 22 prs. dies, 2 tap wrenches, 43 taps, cycle, B.S.F., Whitworth, 30s.; Set 8 prs. Dies, stock, 8 prs. taps, tap wrench, cycle, £1; Set "Little Giant" pipe dies and stock 4 dies, 5 taps, £1; Gas Stock and 3 prs. Dies, ⅛", ¼", ⅜", 10s.; Large Stock, ½" die, and ⅝" and ¾" Whit. taps, 10s.; Set Wells Bros. Adjustable Dies with guides, ⅛", 5/32", 3/16", 7/32", ¼", near new, £1. Particulars any above. Stamp! —MORRIS, Engineer, Countesthorpe, Leicester.

Wanted, Atlas Yankee Lathe, 3½" centre.—CLARK, 23, Ebenezer Street, Sheffield, 3.

Our Popular 1s. 9d. Bargain Lots, any four lots, 6s.; Lot 1, Gross Whit. Screws, ⅛" to ¼"; Lot 2, 1 Gross Bright Steel Chamfered Washers, ⅛" to ⅜"; Lot 3, Two Bundles Emery Cloth Strips, weight 2 lb., fine, medium, coarse; Lot 4, Three B.S.F. Taper Taps, ¼", 9/16", ⅝"; Lot 5, 1 Doz. Small Files to 6"; Lot 6, Six Files to 12"; Lot 7, 6 Doz. Assorted Springs good variety; Lot 8, ⅜" Square Shank Tool Holder, complete with H.S. Turning Tool; Lot 9, Three No. 1 Morse Taper Shank Twist Drills, 9/32" to ½"; Lot 10, ⅞" B.S.F. Taper and Plug Taps; Lot 11, 1½" Whit. Taper or Plug Tap; Lot 12, Six Assorted Shapes Norton Grinding Wheels, 1½" dia., ½" hole.—Below.

Clearance of Large Taps, Whit. and Gas only, 1¼" to 2" Whit., and 1¼" to 4" Gas, all new, best makes, eight assorted, £1; One tap alone worth the money. We will do our best to supply to customers' requirements, but do not guarantee to do this. Carriage forward.—Below.

3 Tons Best Sheffield Files, Flats, Half Rounds, Square, Rounds, in rough and second cut sizes, 6", 8", 10", 12" this is a very special bargain offer, wonderful value, three dozen assorted, 10s.; also large files, 14", 16", 18", dozen assorted, 8s. 6d., carriage forward.—Below.

250 Bundles Bright Drawn Mild Steel, approx. 5" length each piece, sizes ⅛", 5/32", 3/16", 7/32", ¼", 9/32", 5/16", ⅜", 7/16", ½" round, 5s. 6d. per bundle of 50"; also Square Bright Steel, sizes ⅛", 3/16", ¼", 5/16", ⅜", 7/16", ½". 5' lengths, 6s. bundle. —Below.

5,000 Small Slitting Saws, ¾" dia., 1/32" thick, clear at 2s. per doz.—Below.

2,000 Slitting Saws, 2¾" dia., 1" hole, 1/64" to ⅛" thick, six assorted, 3s. 6d.—Below.

1,300 Sets Hexagon Die-Nuts, Sheffield made, Whitworth, B.S.F., also American thread, U.S.S. and S.A.E. suitable for Ford and other American cars ¼", 5/16", ⅜", 7/16", ½", worth 7s. set, our clearing price, 2s. 9d. set; all the above four sets, 10s. lot.—Below.

120 Bundles Best Quality Silver Steel, round, 1/16" to ⅜", 16 standard sizes, 4s. per bundle.—Below.

500 High Speed Tap Fluting Cutters, cuts taps ⅛" to ⅜", dia. of cutters 1¼", ⅝" hole, 1s. 3d. each, three assorted, 3s. 3d., worth 6s. each; also larger Cutters, 2½" dia., ½" hole, cut taps ⅜" to 1", 1s. 9d. each; three assorted, 4s. 6d.—Below.

250 Sets Feeler Gauges, 10 blades, long taper, 1½ to 25 thous., a very useful bargain, 1s. 9d. each.—Below.

300 Drill Chucks, takes to ½", three jaws. No. 1 Morse taper shank or ½" straight shank, 2s. 9d. each.—Below.

500 Gross Tungsten Steel Hacksaw Blades, 8", 9", 10", 12", 1s. 3d. per doz.; 12s. per gross; also Machine Blades, 12" × 1", 2s. doz.; 20s. gross; 14" × 1", 3s. doz.—Below.

1,000 Sets Hexagon Die-Nuts, C.E.I. Cycle Thread, 3/16", ¼", 5/16", ⅜", usual price 5s. 9d. set, clear at 2s. 3d. set.—Below.

1,200 Best Quality Straight Shank End Mills, standard sizes, ¼" 1s. 3d.; 5/16" 1s. 4d.; ⅜" 1s. 6d.; 7/16" 1s. 9d.; ½" 2s. each. All right-hand, suitable for use in lathe.—Below.

800 Sets 1" Circular Dies. Screwing ¼", 5/16", ⅜", 7/16", ½", Whitworth and B.S.F. Clearing at 2s. 9d. per set. Both sets 5s. Die Stocks to suit 1s. 9d. each.—Below.

100 Boxes of Assorted Springs, approx. weight 3 lbs. From 300 to 600 springs. 3s. 6d. per box.—Below.

5,000 Tins Reliable Case-hardening Mixture, for use with ordinary fire, very effective, as used in several large Sheffield works, sample 1 lb. tins. 1s. 3d.; 2 lbs., 2s. 6d.; simple to use and guaranteed to give a glass hard surface to steel or iron, cash refunded if it fails to more than satisfy.—Below.

350 Boring Tool Holders, ½" Square Shank, fitted with ⅜" round boring bar, complete with high speed tool. These are a very good bargain. Actually worth 8s. 6d. each. Clearing at 3s. 9d. each.—Below.

60 Only, Genuine Norton Grinding Wheels, suitable for general shop use, 9" dia., 1" wide, 1" hole, 4s. 9d. each, also few 1¼" wide, 5s. 9d. each.—Below.

1,000 Fine Emery Wheels, 2" to 4" dia., ⅜" hole, ⅛" to ¼" thick slightly used, but quite serviceable, 1s. 6d. per doz.—Below.

5,000 Genuine Norton Grinding Wheels, 2¼" dia., ⅜" to ¾" wide, ¾" hole, three assorted 1s.; dozen assorted 3s.; six dozen 15s.; gross 25s.—Below.

10s. Orders Carriage Paid except where stated otherwise, steel bars and files carriage extra.—J. BURKE, 30, Trippet Lane, Sheffield.

Wade Lathe Screwcutting Attachment, 15s., post 1s. 3d. extra.—AIRD, Gardner Street, Brighton.

Tools by Easy Payments. Lathes, 25s.; Compound Rests, 15s.; Foot Treadles, 35s.; Saw Benches, Power, £3; Treadle, £6 10s.; Constructor's Saw Fitments, 12s. 6d. Lists, 2d.—BROWN BROS., Accrington.

Treadle Fret Machine, improved Roger, 12s. 6d.; Also Treadle Gear for Sewing Machine, 5s.; Ice Skates, 4 pair, 5s.—HONEYSUCKLE, Sturry, Kent.

The 'Myford" 3" Lathe. The most popular model on the market. Used by Technical Schools, Instrument makers, Garages and Production Works. Moderate prices. Latest design. Illustrated lists from.—THE MYFORD ENGINEERING Co., Neville Works, Beeston.

Watchmaker's Precision Lathe, fully compound sliderest, chucks, colletts, c/shaft, handwheel, pulleys, etc., absolutely complete, £7 10s.; ¼ h.p. A.C. Neco Electric Motor, £3, slightly used together.—MURRAY, 33, Curling Vale, Onslow, Guildford.

Ball Bearings. Bargain to clear, new Skefko bearings, 1½" dia. × 11/16" bore, 2s. 6d. pair; 24s. doz pair.—FACTORY, 1, Western Road. Tunbridge Wells.

3" Zyto Treadle Lathe, nearly new, S.C., chuck, tools, New ½" Bench Drill, £9 lot.—SIMMS, 12A, Cockmannings Road, St. Mary Cray, Orpington, Kent.

5" Lathe, Stand, Treadle, faceplate, etc., £4.—106, Cromwell Road, Hayes, Middlesex.

6" Sterling Independent Chuck, screwed ⅝" Whit., small overhang, almost new, cost £2 10s., sell £1 5s. 4½" S.C. Chuck, 2 sets jaws, no backplate, good condition, 10s.—CLARK 9, King's Park Road, Glasgow.

At Prices to Attract Dealer or User. Lathes, Grinders, Slotters, Shapers, etc. Send for list or rebuilt machine tools.—V.S.P. ENG. Co., Wilstead, Bedford. Phone, Hayes 28.

5½" B.G. Lathe, G.B. swivelling compound slide rest, £6 10s.; 5" Plain Lathe, swivelling compound slide rest, £4; Roots Blower, 1½" outlet, £2; Workshop Incandescent Paraffin Lamp, 200 c.p., 27s. 6d.; Drill Chuck, takes 9/16", 6s.; Hangers, Pulleys.—67, Downes Road, Langley, Slough.

3½" Bench Lathe, back geared, compound slide rest, £2 15s.; Countershaft for above, new, £1 10s. Wanted, High Speed Driller, Power Lathe, Tools, Chuck for 4" Drummond.—BISHOP, 148, Wood Street, E.17.

1½ h.p. Petter, petrol-paraffin, very good condition, £5 10s.; Hand Shaper, perfect condition, 8" stroke, auto transverse, table 9" × 9". £4 10s.; 4 Jaw Chuck, as new, 12" diameter, £3 10s.; worth double; Punching Machine, capacity 5/16" dia., × 7/32" thick, weight 29 lbs., £1; No. 2 Pipe Vice Grip, 2" to 4", 33 lbs., 7s.; Lathe, 6½" centres, by Burton Griffiths Co., 15/16" hollow mandrel, sliding and surfacing, 6" bed, faceplate, new 5" self-centring chuck, 2 sets jaws, countershaft, complete; £16; or less chuck and countershaft, £12 10s. Large quantity of chain sprockets, all sizes from 8 T. to 18". Also bevel worm and spur gears.—HARRING & SONS, Trowbridge.

Electric Drills, fully reconditioned, all voltages, universal, ¼" max., 19s. 9d.; also ⅜" max., 26s.—ANCEL CINE Co., 7, Highbury Terrace Mews, N.5.

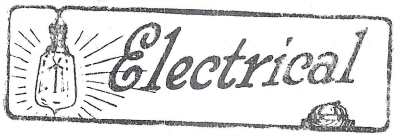
Milnes 4" Sliding Screwcutting Lathe, hollow spindle, treadle and power, complete tool.—NEWTON JENNINGS, Park Road, Bradford.

Must Be Sold, Closed Down. 1" Bench Bending Machine, 24s.; Power Driven Rotary Cutting Machine, 16" F. & L. pulleys, 46s.; "Churchill" Hand Morticing Machine, 7 chisels, bargain, £5 15s.; No. 3 Flypress, vee slide, with supporting arm, 58s.; Leg Vices, 4½", 15s.; 48" Double Ended Grinder, 79s.—NEWTON, 969, Bristol Road South, Northfield, Birmingham.

Lathes! Carefully Consider This. Do you want a first-class lathe for £5? We have a big stock of MK.I "Lyonite" 3" Bench Lathes. Full screwcutting, back geared, gap bed, fully compound slide rest, cross sliding milling table, hollow mandrel, 7" faceplate, centres, machined chuck back, 11 cut gears, mechanical automatic screwcutting indicator, all square threads, set over tailstock, collet chucks and draw-in spindle, a good stiff job, you can take a cut on these lathes. With a screwcutting chart and working instructions. New, unused and beautifully finished. Note, only obtainable from us, as supplied to leading technical colleges and firms. Treadles, shafting, pulleys, etc., equally cheap. Call and inspect one anytime except Fridays, or send stamped envelope.—"M.E.," 80, Ridgeview Road, Whetstone, N.20.

Portable Electric Drill, D.C. 220-240 V, 60s.; Starter Battery Repair Replate Outfit, 80s.; Pair Self Aligning 6"-8" Oil Ring Hangers, as new, 1¾" shaft, 35s.; Welding Outfit, oxygen acetylene gauges, universal blowpipe, 80s.—35, Sutton Lane, Chiswick.

5½" Centre Hollow Spindle, S.S. Gap Lathe, chuck, countershaft, £12; 5" Centre S.C. Lathe, 4' 6", chuck, £6; 6" Centre B.G. Compound, rest, £5; 4" Centre Gap S.C. 4' Lathe, £3.—FAIRHURST, Atlas Forge, Ince, Wigan.



Now on Sale "Practical Electrician's Pocket Book, 1936," 2s. 10d., Post Free.—Dept. E.M. 3, ODHAMS PRESS, LTD., 85, Long Acre, London, W.C.2.

Electric Clocks. Parts and castings from SYNCHRONOME Co., LTD., 32, Clerkenwell Road, E.C.

A.C. Induction Motors, all Voltages. New. 1/25 h.p., 18s.; 1/10 h.p., 35s. Electric Grinders, 21s.; Electric Drill, 39s. 6d. All carriage paid. Trade supplied.—JOHN M. E. STEEL, Clyde Street Mills, Bingley.

¼ h.p. Upwards, A.C. Motors, get my specification and price.—JOHN M. E. STEEL, Bingley.

¼ h.p. New Double-ended Shaft Ball-bearing Universal Motors, any voltage, 36s. 6d. Delivered.—JOHN M. E. STEEL, Bingley.

Exceptional Offer. New ¼ H.P. A.C. Single Phase Motors, 200/240 volts 50 cycles, 1,420 r.p.m., doubl shaft pulley, 50s.; ½ H.P., ditto, single shaft, pulley, 68s. 6d.; 12 months' guarantee.—ALLAM, 6, Great James Street, London, W.C.1.

"Dynamo Design and Construction." By A. H. Avery, A.M.I.E. With 224 illustrations. General Principles—Parts of a Dynamo or Motor and their Functions—Types of Armatures—Field Magnets—End Shields, Bearing Brackets, Bearings, Brush Gear, Terminal Boxes, etc. — Commutators, Brushholders, Rockers, Brushes, Bearings, etc.—Proportions and Output Considerations—Armature Windings and Connections—Field Windings—Insulation, Testing, Temperature—Design and Details of a Modern Commercial 100-watt Generator, etc. Price 4s., post free.—PERCIVAL MARSHALL & Co., LTD., 13-16 Fisher Street, London, W.C.1.

QUERIES and SERVICE DEPARTMENT REPLIES.

(1) Every query and Service Enquiry must be accompanied by a coupon from the current issue, and should be addressed "Query Department" or "Service Department," THE MODEL ENGINEER, 13-16, Fisher Street, London, W.C.1.

(2) Short queries of a general character within the scope of the paper are replied to free of charge provided a stamped addressed envelope is enclosed.

(3) Queries of a general character are not replied to by post, except by special arrangement. They will be dealt with in turn either by a short explanatory article in an early issue, or will be published as letters inviting a helpful response from other readers.

(4) Where technical information by post is specially desired a charge will be made. The query will be handed over to a selected expert on the subject, who will quote his fee for the service required direct to the querist. **All queries asking for the winding details for dynamos, motors, and electric apparatus must be accompanied by a fee of 3s. 6d.;** *a similar fee is harged for any subsequent letters of advice required. A stamped addressed envelope must be enclosed in all such cases.*

"The Model Engineer"
QUERIES and SERVICE DEPARTMENT REPLIES COUPON
To be cut out and enclosed with each Query or Service Enquiry sent in during the week commencing
March 5th, 1936
Read the Rules before posting your Qu ery

Single and 3-phase Motors, all sizes from ½ h.p. upward.—Below.

D.C. Motors, all sizes and voltages in stock.—Below.

Charging Dynamos, various voltages and amperages.—Below.

Motor Generators, single and 3-phase to D.C.—Below.

Petrol-Electric Plants, all sizes from 150 watts. to 2 kilowatts. Stuart, Petter, Lister, Kohler, etc.—Below.

Repulsion Induction A.C. Motors, all sizes to 15 h.p.—Below.

¼ h.p., 220 Volt, D.C. Motors. Bargain prices.—Below.

Quick Release Drill Chucks, unused, ideal for repetition work.—Below.

All Goods Offered Above are Guaranteed in first-class condition.—COLE, Milo Works, Milo Road, East Dulwich, S.E.22. (Forest Hill 4422.)

¼ h.p. D.C. Motors, 200/250 volts, perfect, 22s. 6d. each; A.C. Repulsion Induction, 200/250 volts, £2 2s. 6d. each. Other sizes cheap.—JOHNSON ENGINEERING, 86, Great Portland Street, London, W.1.

To-day's Staggering Value. Twelve only, excellent little enclosed type D.C. Motors, 6 Volt, absolutely modern goods, app. ¼ h.p., instantaneous starting, fully guaranteed, 15s. 6d. each.—Below.

Handsome 15-20 Volt 10-12 Ampere Enclosed Type Lighting and Charging Dynamo, distinctly modern generator, carbon block brushes, ball bearing armature, generates instantly, complete with slide rails and pulley, and including handsome little switchboard, with ampere meter, main switch, double fuses, and very high-class automatic cutout. A gift, absolutely, £3 2s. 6d. Impossible to repeat this installation.—Below.

Handsome Selection of Stationary Type Engines, petrol, paraffin. "Listers," "Petters," "Fairbanks," "Bulldog," "Bentall," "Alden," "Universal," "Tangyes" and many others. From 2 h.p. upwards. State requirements.—Below.

Very Sturdy 1½-2 h.p. "Crossley" Engine, fitted with magneto, carburettor, starting handle, ignition plug, and including fuel tank and silencer. A very easy starter indeed, and especially reliable. There's years of service in this substantial and very high-class engine. Yours at £4 18s. 6d. spot cash. Ideal for driving dynamo or workshop machinery. The old firm.—UNIVERSAL MOTOR COMPANY, St. James' Road, Derby.

Lion Engine, 5 h.p., petrol or paraffin, portable or stationary, 2 flywheels, magneto, hopper water cooled, in splendid condition, £7 10s., carriage forward.—Below.

Dynamos, for charging or lighting, fully guaranteed, 12 V-8 A, 17s. 6d.; 20 V-5 A, 32s. 6d.; 30 V-8 A, 42s. 6d.; 50 V-4 A, 37s. 6d.; 50/75 V-12 A, 70s.; 100 V.-10 A, 65s.—Below.

Charging Resistances, stud and switcharm type, various sizes, 12s. 6d. each; Automatic Charging Cutouts, 7s. 6d.—Below.

Fire Alarm Call Telephones, complete in glazed cabinet for outdoor fitting, battery working, 12s. 6d. each.—Below.

Spark Coils, for 2" spark, 17s. 6d.; 10" spark, 70s.; 15" spark, no break, 50s.; mercury break, 30s.—Below.

Check Meters for A.C. mains, watt hour type, 200/250 V, 50 cycle, single phase, for workshop or subletting, tell how much current is used, 6s.; post 1s.—Below.

7 V Amplifier, with 2 V valves, for battery working, 17s. 6d.; Western Electric Microphones, 2s. 6d.—Below.

Ex R.A.F. Cossar Valves, new, 2 V dull emitter, for H.F., L.F. or D.E.T., 1s. 3d. each; or 3 for 3s. pos free.—Below.

Heavy Duty Morse Keys, 5s. 6d.; Battery Charger, 110 V A.C. input and 25/50 V-8 A output, 50s.—Below.

Galpin, 75, Lee High Road, Lewisham, London, S.E.13. Cash with order or C.O.D. Visitors welcome, send your enquiries.

"Electric Testing Simplified." A practical manual and bench companion. The chapters in this book give a full description of various Measuring Instruments, Electro-Mechanical Aids to Testing, the Voltmeter and Ammeter, Meter for Special Purposes, Notes on the Reading, Care and Maintenance of Meters, Insulation Testing and Inspection, Electrical Resistance Tests, Domestic Electric Appliances, the Testing of Cells, Industrial Dynamo and Motor Testing, and Testing Motor Car Electric Plant. 190 pages, 103 illustrations, well indexed. Price 5s. 6d. post free.—PERCIVAL MARSHALL & Co., LTD., 13-16, Fisher Street, London, W.C.1.

Engines

Demon Engines, 3½ and 4½ h.p., 18 and 20 gns. each. 1½ and 2½ h.p. Castings if required.—Vauxhall Works, Longton, Staffs.

½ h.p. Repton Gas Engine, cooler, silencer, etc. Offers. — DUFF, 12, Charlotte Street, Brighton.

"Ailsa Craig" Petrol Engine, 4 h.p., water-cooled, on heavy steel cradle, Zenith carburettor, automatic controlled by governors, complete with pulley, petrol tank, large cooling tank, silencer, pipes, etc., 12 volt Dynamo, ampmeter and panel, complete driving and lighting unit, £8; seen running.—TINDALL, "Scotsgrove," Elmhurst Road, Langley, Bucks.

Galvanised Tanks suitable engine, cooling oil or water storage, 60 gallons, 15s.; 100 gallons, 20s.; 160 gallons, 35s.; new, carriage paid.—ABBEY, Watton, Norfolk.

Business

Castings in All Metals, Machined or Rough. Name Plates, Steel Stamps, Stampings. Experimental Work and Small Mechanisms.—HILLIER & SON, 3, Beaufort Gardens, London, S.E.13.

Inventions Patented. J. E. S. Lockwood, 3, New Street, Birmingham. Advice and Guide Free.—Established 21 years.

J. B. S. Poyser, Peck's Hill, Mansfield. Scientific Instrument and Inventor's Model Maker, Spiral, Bevel and Spur Gear Cutting, Turning and Milling. Established over 30 years. 'Phone 148.

Ladies and Gents.' Chromium Shockproof Lever Wristlets (strapped) from 4s.; pockets, 2s. 3d.; list 4d. Materials, tools, invar steel, wheelcutting, repairs, etc., list 6d.—YOUNG & SON, Material Dealers, Chippenham.

Castings, Forgings, rough or machined to drawings or patterns, all classes of machining done, models made. inventors helped. — W. BADGER, Cupola Engineering Works, Rotherham.

Patents Trade Marks. Free Advice, Handbook and consultations.—B. T. KING, C.I.M.E., Patent Agents. 146s, Queen Victoria Street, London, E.C.4. 50 years' references. City 6161.

High-Class Light Mechanical Work, Repairs, etc. Estimates free.—LEWIS GATENBY, Engineer, 17, Thornton Lodge Road, Huddersfield.

Light Engineering, Experimental, Model and Repair Work. Accuracy guaranteed. Estimates given.—WOODFALL Willowbrook Grove, Trafalgar Road, London, S.E.15. Phone, Bermondsey 1294.

Small Old-established Engineering Speciality Business for Disposal. 5 years' training given to purchaser. £1,000. Letters only, to. — BUTLER, 21, Bexley Road, Erith.

General Machining. Our extensive plant now at your disposal, good prices and delivery for small quantities. Turning, milling, planing, shaping, gears, etc.—HARRING AND SONS, Trowbridge.

Express World Delivery, "Simple Decorative Work," "Turning" (beginners), "Possibilities Small Lathe," Lukin, 2s. each; C.O.D., 6s. 6d. set; "Ornamental Turning," Evans, (3 vols.), 6s. set; C.O.D. 6s. 6d.; Both sets C.O.D., 12s. 6d. "Blacksmith's Manual," Lillico, "Smithy-Forge," Crane, 13s. set: C.O.D. 13s. 6d.; "Mechanics Workshop Companion," Templeton, 8s.; C.O.D., 8s. 6d.; "Metal Turner's Handybook," "Lathe Work," "Model Engineer's Handybook," Hasluck, 10s. 6d. set; C.O.D., 11s.; "Sheet Metal Worker's Instructor," Warn, 6s. 6d.; C.O.D., 7s.; "Practical Sheet and Plate Metal Work," Atkins (460 illustrations), 8s.; C.O.D., 8s. 6d. World delivery, carriage paid. C.O.D. service England, Scotland, Wales, Northern Ireland. Foreign and Colonial customers must send cash. — ALBERT FEATHER, Mail Order Bookseller (Brand New Books), 93, White Abbey Road, Bradford, Yorkshire, England.

Grooved Pulleys, Shafting, Bearings Belting. Price Lists on application. — THE GROOVED PULLEY CO., 27, Jesse Road, E.10.

Wanted

Lathes, from 3½" to 6", Drummond, Britannia, I.X.L., Edgar, Exe, Zyto, Patric, Eta, Milnes or any other good make purchased for cash. — ROSS & ALEXANDER (LONDON), LTD., 165, Bishopsgate, E.C.2.

Wanted for Prompt Cash. Home Ciné Cameras, Projectors, Films, Accessories, Microscopes, Telescopes, Binoculars, Optical and Mechanical Goods, Precision Tools, Small Lathes and Modern Cameras.—FRANK, 67, Saltmarket, Glasgow.

Small Good-Class Electrical and Mechanical Models, Chemical and Scientific Apparatus, Tools, Measuring, Meteorological and other Instruments Wanted.—ANDREWS, 27, New Bailey Street, Salford.

Lathes Purchased for Cash. We are the leading London mart for all types of machines up to 6"; Drummonds, Britannia, I.X.L., Edgar, Exe, Eta, Milnes, Myford, or part exchange for new machines. Service with courtesy.—BUCK & RYAN, Dept. M., 310-312, Euston Road, London, N.W.1.

Wanted, Small Rotary Air Compressor.—Box 968, MODEL ENGINEER Offices.

Set Change Wheels for Drummond 4".—ROBERT BROOKFIELD, Chapel Lane, Banks, Southport.

"B" or "C" Class Outboard Racing Engine, good condition, must be cheap.—EDWARDS, 156, Anderton Road, Sparkbrook, Birmingham.

Situations Vacant

An Opportunity is offered to Skilled Fitters to learn Aero-Engine work in the Royal Air Force. Particulars may be obtained from.—THE INSPECTOR OF RECRUITING, R.A.F., Victory House, 30, Kingsway, London, W.C.2.

Salesman Wanted, spare time, 35s. weekly easily earned. Apply.—H. RICHFORD, LTD., Snow Hill, London.

Handyman Wanted for Hotel. Knowledge of Plumbing, Electrical and Furniture Repairs. Wages £2 per week. All food provided. Liverpool district.—Box 973, MODEL ENGINEER Offices.

The MODEL ENGINEER'S DIARY
OF FORTHCOMING EVENTS.

March 5th—South London Experimental and Power Boat Club. "Casting by the Burnt-out Wax Process," by Mr. W. Savage; "Metal Hull Building," by Mr. E. W. Vanner.

March 5th—Norwich and District Society of Model Engineers. Talk on the making of Gas, by Mr. Scott, Works Chemist of the British Gas Light Co.

March 5th—Walsall and District Society of Model and Experimental Engineers. Talk on "Domestic Refrigerators, with some Suggestions for their Construction," by Mr. Gray.

March 5th-7th—Nottingham Society of Model and Experimental Engineers. Seventh Annual Exhibition at the Victoria Exhibition, Bath, Nottingham.

March 6th—Junior Institution of Engineers. Lecture, "Mono Pumps," by Mr. J. Armes.

March 12th—Manchester Model Railway Society. Hot-Pot Supper, 7.30 p.m.

March 13th—Junior Institution of Engineers. Dinner at the Hotel Metropole, Northumberland Avenue.

March 19th—South London Experimental and Power Boat Club. Invitation Night.

March 23rd—Croydon Society of Model Engineers. Discussion Night.

March 24th—Manchester Model Railway Society. Two films to be shown and described by Mr. G. A. Warburton, of the L.M.S. Railway, 7.15 p.m.

April 4th—Society of Model and Experimental Engineers. Annual Dinner at Criterion Restaurant.

April 6th—Society of Model and Experimental Engineers. Rummage Sale.

April 16th—Society of Model and Experimental Engineers. Presidential Address, by Mr. T. N. Gilbert.

June 4th-6th—Herne Bay Miniature Yacht Club. Exhibition of Models in the Grand Pier Pavilion.

THE RATE is 1d. per word throughout Minimum Charge One Shilling

The CLASSIFICATIONS are

General, Models, Wireless, Motoring, Tools, Engines, Electrical, Business, Wanted

(Please put a ring round Section applicable to this advt.)

						1/-
						1/6
						2/-
						2/6
						3/-
						3/6
						4/-

PLEASE WRITE IN INK.

Name and address are charged for, and *compound words count as two words.* Box Nos. are charged 6d. extra for postage, and must conclude as follows: "Box————, MODEL ENGINEER Offices" —these words are charged at the usual rate.

ALL ADVERTISEMENTS MUST BE PREPAID.

USE THIS FORM and post (not later than Thursday for following week's issue) with remittance to cover cost to The Advt. Manager, "The Model Engineer," 13-16 Fisher Street, London.

A supply of "Smalls" forms will be sent post free upon application.

Printed in Great Britain for the Proprietors by Electrical Press, Ltd., 13-16, Fisher Street, Southampton Row, W.C.1, and published by Percival Marshall & Co., Ltd., 13-16, Fisher Street, London, W.C.1.